ENVIRONMENTAL ASSESSMENT

Gray Wolf Damage Management in Montana for the Protection of Livestock, Other Domestic Animals, Human Safety, and Other Resources

Prepared by

United States Department of Agriculture
Animal and Plant Health Inspection Service
Wildlife Services

in Cooperation with

Montana Department of Fish, Wildlife and Parks

and in Consultation with

United States Department of the Interior
Fish and Wildlife Service
Bureau of Land Management

United States Department of Agriculture
Forest Service

Montana Department of Livestock

Confederated Salish and Kootenai Tribes

Blackfeet Nation

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LIST OF ACRONYMS

APHIS	Animal and Plant Health Inspection Service
AVMA	American Veterinary Medical Association
BLM	Bureau of Land Management
BN	Blackfeet Nation or Blackfeet Tribe
BO	Biological Opinion
CE	Categorical Exclusion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSKT	Confederated Salish and Kootanai Tribes
DPS	Distinct Population Segment
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FR	Federal Register Notice
FY	Fiscal Year
GWDM	Gray Wolf Damage Management
GYE	Greater Yellowstone Ecosystem
IDFG	Idaho Department of Fish and Game
IWDM	Integrated Wildlife Damage Management
LRMP	Land and Resource Management Plan
MCA	Montana Code Annotated
MDOL	Montana Department of Livestock
MIS	WS Computer Data Base, Management Information System 2000
MFWP	Montana Department of Fish, Wildlife and Parks
2003 GW Plan	Montana Gray Wolf Conservation and Management Plan 2003
MLLB	Montana Livestock Loss Board
MOA	Memoranda of Agreement
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NRM	Northern Rocky Mountain
NWRC	National Wildlife Research Center
RMP	Resource Management Plan
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USC	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
WDM	Wildlife Damage Management
WS	Wildlife Services
YNP	Yellowstone National Park

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 BACKGROUND

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) Wildlife Services (WS) program, in cooperation with the Montana Department of Fish, Wildlife and Parks (MFWP) and in consultation with the U.S. Fish and Wildlife Service (USFWS), Bureau of Land Management (BLM), U. S. Forest Service (USFS), Montana Department of Livestock (MDOL), Confederated Salish and Kootenai Tribes (CSKT) and Blackfeet Nation (BN) have prepared this Environmental Assessment (EA) which analyzes the potential environmental impacts of alternatives for reducing gray wolf (*Canis lupus*) damage to livestock and other domestic animals and to protect human safety.

Following the preparation and issuance of an Environmental Impact Statement (EIS) (USFWS 1994), USFWS introduced gray wolves in Yellowstone National Park (YNP) and central Idaho in 1995 and 1996 as experimental, nonessential populations (59 Federal Register Notice (FR) 60252-60281)[1]. Following this reintroduction, the wolf population in the Northern Rocky Mountains (NRM) steadily increased and the established biological recovery criteria were reached by 2002 (USFWS 2003, 2012*b*). The 1994 10j rule, under which wolves were originally reintroduced, was subsequently revised in 2005 and again in 2008 (73 FR 4720-4736) to provide for greater management flexibility to deal with the growing number of wolves (USFWS 2012*b*).

In the NRM, 2011 marked the tenth consecutive year that the minimum recovery goal of at least 30 or more breeding pairs and at least 300 wolves were documented in Montana, Idaho and Wyoming. The current NRM wolf population of at least 1,774 wolves in more than 109 breeding pairs has far exceeded the originally established biological recovery objectives. On April 2, 2009, the USFWS issued a final rule (74 FR 15123-15188) recognizing the NRM Distinct Population Segment (DPS) and removing wolves from the Idaho and Montana portions of the NRM DPS from the federal threatened and endangered (T&E) species list. The delisting decision became effective on May 4, 2009, but was subsequently challenged in court by a coalition of environmental groups. Plaintiffs requested that the court enjoin the planned fall 2009 wolf hunting seasons in Montana and Idaho because they were likely to prevail in court over the legal merits of the case and hunting could irreparably harm the NRM wolf population. The court declined to grant the injunction because there was unlikely to be harm to the NRM wolf population, but indicated that the plaintiffs were likely to win the case on its merits. On August 5, 2010 a U.S. Federal District Court Federal District Court in Missoula, Montana ruled that delisting could not proceed without including Wyoming and vacated the delisting rule for wolves in the NRM.

On April 15, 2011, President Obama signed Public Law 112–10 which required revision of the T&E species list by removing most of the NRM population of gray wolf as a DPS effective May 5, 2011. The USFWS published a final rule delisting wolves in Idaho, Montana and parts of Oregon, Washington and Utah and the states will monitor wolf populations in the NRM DPS and gather population data for at least five years (74 FR 15213 et seq.).

On May 5, 2011 the USFWS published the final delisting rule designating wolves throughout the DPS, except Wyoming, as a delisted species and subsequently the Center for Biological Diversity filed a challenge in federal district court in Missoula, Montana, arguing that a congressional rider requiring removal of Endangered Species Act (ESA) protections for wolves in the NRM was unlawful because it

[1] 59 FR 60252-60281 established regulations allowing management of wolves to minimize conflicts. The USFWS authorized WS to investigate reported wolf predation on livestock and to implement corrective measures, including nonlethal and lethal actions, to reduce further predation.

violated the separation of powers in the U.S. Constitution. However, the lawsuit challenging the constitutionality of the Congressional delisting was unsuccessful (Alliance for the Wild Rockies, et al. v. Salazar, et al., CV-11-70-M-DWM, Center for Biological Diversity, et al. v. Salazar, et al., CV-11-71-M-DWM, Aug 03 2011). On August 8, 2011, Plaintiffs in the above lawsuit gave notice that they appealed to the U.S. Court of Appeals for the Ninth Circuit CV-11-71-M-DWM, the order issued by District Judge Donald W. Molloy[2]. Judge Schroeder of the Ninth Circuit issued an opinion, dated March 14, 2012, ruling that Section 1731 (the wolf bill) was constitutional, a legal action of Congress, and that the delisting of wolves by Congress in the NRM was fully legal[3]. The USFWS (2012*b*) Recovery Program Update Reports summarize relevant delisting and litigation activities that have transpired.

With the current delisting, the Montana Wolf Conservation and Management Plan (MFWP 2003 - *henceforth known as* the 2003 GW Plan), Montana state law and administrative rules for gray wolves as a species in need of management (Montana Code Annotated (MCA) §87-5-131) are the principal guidance for managing wolves in Montana. In addition, BN (2008) and CSKT (2009) have wolf management plans *(henceforth known as* GW Plans, to include the 2003 GW Plan) on their reservations. These plans permit more flexibility in addressing wolf damage problems and conflicts than what was permitted while wolves were federally listed. Whether wolves are managed by MFWP or some other agency, the role of WS is essentially unchanged. All management activities are under the direct authority of the managing agency responsible for wolves in Montana, currently MFWP and Tribes, regardless of who that may be at the current time.

Three alternatives for WS involvement in gray wolf damage management (GWDM) are analyzed in this EA, including the (No Action, Preferred Alternative), which is to continue the Current Program as currently administered by WS under MFWP and Tribes. Under the No Action, Preferred Alternative, WS would use or recommend the full range of legal, practical and effective nonlethal and lethal methods for preventing or reducing wolf damage while minimizing any potentially harmful effects on humans, wolves, other species and the environment[4]. Management strategies would be developed for individual situations by applying the WS Decision Model (Slate et al. 1992). When appropriate, ranch management practices (animal husbandry), frightening devices and livestock guarding animals could be recommended and used by the rancher to reduce wolf damage to livestock. In other situations, WS could use foothold traps, snares, ground shooting, denning[5], chemical immobilization with euthanasia, and aerial gunning to remove problem wolves.

When determining the most appropriate damage management strategy, WS Specialists give preference to nonlethal methods that are deemed practical and effective (WS Directive 2.101) for a given situation. However, lethal methods may be used to reduce damage after practical and appropriate nonlethal methods were considered and implemented by the producer or WS or tried and determined to be ineffective or inappropriate to reduce damage to acceptable levels. The most appropriate initial response to a wolf damage problem may be a combination of nonlethal and lethal methods or, in some instances as appropriate, the application of lethal methods alone.

The second alternative would require WS to use and provide advice on only nonlethal methods for GWDM. MFWP, Tribes, and property owners would still be able to use lethal methods in accordance

[2] Judge Molloy ruled that Congress has full authority to amend its own laws, including the Endangered Species Act, and that the delisting by Congress was constitutional.

[3] It is possible that this case may be appealed to the Supreme Court and if this occurs, WS would cooperate with the agency that has management authority for wolves in Montana and this EA would provide the analysis and overarching NEPA compliance for actions conducted under such a scenario.

[4] As new methods are developed and approved for use by WS, MFWP, or USFWS, they may be incorporated into the proposed action.

[5] Denning, for wolf damage management in Montana, is defined as the removal of wolf pups from a den using an approved method.

with the GW Plans, and Montana state law and administrative rules for gray wolves as a species in need of management (MCA §87-5-131).

Under the first two alternatives, WS GWDM assistance could be provided on private or public property when MFWP, Tribes, and resource owners or managers request assistance to alleviate wolf damage, when damage or threats are verified, and where agreements or work plans have been completed specifying the details of the damage management action to be conducted. The types of verified wolf conflicts that could be addressed would include: 1) depredation/injury of domestic animals, 2) harassment/threats to domestic animals, 3) property damage, and 4) injury or potential threats to human safety (*e.g.*, habituated/bold wolves). Lethal take of wolves by the public could also potentially occur during regulated sport harvest seasons. All GWDM would be conducted in compliance with appropriate Federal, State, Tribal, and local laws and regulations and under the direct authority of MFWP, Tribe, or other managing agency.

Under the third alternative, WS would not be involved in GWDM in Montana, but MFWP, Tribes, and property owners, without Federal assistance, would still be able to use lethal and nonlethal methods in accordance with the GW Plans, and Montana state law and administrative rules for gray wolves as a species in need of management (MCA §87-5-131).

The environmental issues considered for each alternative include impacts on the wolf population in Montana, effectiveness of lethal and nonlethal damage management efforts in reducing wolf predation on livestock, effects on public and pet health and safety, and humaneness and animal welfare aspects of the methods proposed to be used.

1.2 INTRODUCTION

A wide range of opinions exists regarding gray wolves and wolf management, and problems arise when wolf activities conflict with human interests (GW Plans). As wolf populations increase, conflicts with humans increase, including increased killing of livestock and pets tempered by factors such as agency management actions (Mech 1995, Hanauska-Brown et al. 2012). These conflicts sometimes contribute to very polarized positions, ranging from extreme dislike of wolves and the government bureaucracy associated with wolf management, to the view that livestock and livestock producers are the primary problem, and that wolves are a charismatic species that should be fully protected. The level of support for, or opposition to management[6], is almost totally dependent on the perceived value of the species being controlled and the perceived benefits or detriments expected to result from management efforts (Garrott et al. 1993). The wolf's high reproductive potential and its tendency to disperse over large geographic areas insure that there are few places where wolves could be restored without some form of active management being necessary (Fritts et al. 1992, Mech 1995, Bangs et al. 2005, 70 FR 1286-1311, 74 FR 15123-15188). USDA, APHIS, WS program Final EIS (*hereinafter referred to as* USDA 1997) summarized the relationship in North American culture regarding wildlife values and wildlife damage in this way:

> *"Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife generally is regarded as providing economic, recreational and aesthetic benefits . . . , and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and values is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only*

[6] One of the best ways to promote wolf recovery may be to encourage education about wolf management issues so that a significant portion of the public would support wolf recovery while tolerating some level of management (Mech 1995).

the needs of those directly affected by wildlife damage but a range of environmental, socio-cultural, and economic considerations as well."

Montana's wolf population has surpassed the biological recovery goals set by the USFWS (MFWP 2009), and finding evidence of wolves (*i.e.*, tracks, scats, howling, and wolf sightings) has become increasingly more common for people frequenting the outdoors in Montana. Many people perceive this as a very positive development. Along with the increase in Montana's wolf population, however, there has been complaints of wolf predation on livestock and other domestic animals (WS 2010, MFWP 2010, Hanauska-Brown et al. 2012), and MFWP, Tribes, and hunting organizations have expressed concerns about the impacts of wolf predation on elk (*Cervus canadensis)* populations and elk hunting opportunities (Mader 2008, Backus 2010). The Montana WS program cooperates with MFWP, USFWS, CSKT, BN, and other agencies and groups to address wolf predation and threats to livestock and domestic animals, property, and human health and safety. WS receives complaints and keeps data in a computer-based Management Information System (MIS[7]). Work tasks and damage associated with wolves from FY07 (fiscal year 2007, Oct. 1, 2006 to Sept. 30, 2007) to FY11 is in Table 1-1. In all WS had an annual average of 3,527 work tasks associated with wolves and recorded about $320,000 in damage.

Table 1-1. The number of requests for assistance and value of damage to all resources caused by wolves in Montana as reported to or verified by WS personnel from FY07 to FY11. The damage reported is only a fraction of the actual damage caused by wolves in Montana because WS does not hear about all depredations and many livestock are just missing and not found.

Category	Resource	FY07		FY08		FY09		FY10		FY11		Average	
		WT	$ Value $	WT	$ Value $	WT	$ Value $	WT	$ Value $	WT	$ Value $	WT	$ Value $
Livestock	Cattle	1,697	$101,082	1,541	$92,688	3,700	$268,027	3,964	$473,774	2,743	$298,165	2,729	$246,747
	Sheep/Goats	165	$12,415	395	$49,360	824	$77,100	617	$15,125	305	$38,780	461	$38,556
	Horses/Mules/Burros	258	$11,153	168	$60,000	84	$16,100	75	$20,975	77	$11,500	132	$23,946
	Llamas	57	$2,595	15	$27228	16	$1,000	11	$1,800	2	$0	20	$6,525
	Other Stock/Poultry	4	$0	1	$0	-	-	1	$0	1	$0	1	$0
Livestock Subtotal		**2,181**	**$127,245**	**2,120**	**$229,276**	**4,624**	**$362,227**	**4,668**	**$511,674**	**3,128**	**$348,445**	**3,344**	**$315,773**
Property	Pets	5	$1,300	12	$500	13	$1,570	2	$0	7	$3,550	8	1,384
	Guard Animals	3	$0	17	$500	30	$8,350	62	$1,025	19	$0	26	1,975
	Other Property	-	-	-	-	1	$300	1	$580	-	-	0.4	176
Property Subtotal		**8**	**$1,300**	**29**	**$1,000**	**44**	**$10,220**	**65**	**$1,605**	**26**	**$3,550**	**34**	**3,535**
Human	Health & Safety	4	$0	217	$0	219	$0	245	$0	51	$0	147	$0
Human Health & Safety Subtotal		**4**	**$0**	**217**	**$0**	**219**	**$0**	**245**	**$0**	**51**	**$0**	**147**	**$0**
Natural Res.	Mammals	-	-	-	-	3	$0	1	$0	3	$0	1	$0
Natural Resources Subtotal		**0**	**$0**	**0**	**$0**	**3**	**$0**	**1**	**$0**	**3**	**$0**	**1**	**$0**
TOTAL WOLF DAMAGE		**2,193**	**$128,545**	**2,366**	**$230,276**	**4,890**	**$372,447**	**4,978**	**$513,279**	**3,208**	**$348,445**	**3,527**	**$318,598**

WTs = Work tasks associated with requests for GWDM assistance to protect that resource and any damage associated with it. One work task for livestock damage could involve multiple predations.

USFWS decisions to remove wolves from the federal list of T&E species has been challenged several times in court. The latest lawsuit challenging the delisting was heard in the U.S. Court of Appeals for the Ninth Circuit (CV-11-71-M-DWM) with Judge Schroeder issuing an opinion March 14, 2012 that Section 1731 (the wolf bill) was constitutional, a legal action of Congress and that the delisting of wolves by congress in the NRM was fully legal[8]. If the status of wolves (listed or delisted) changes, WS will work under the agency that has management authority at the time (*i.e.*, MFWP with wolves delisted, or USFWS with wolves protected under the ESA and GWDM conducted under the provisions of applicable Federal

[7] MIS - Computer-based Management Information System used by WS for tracking Program activities. WS in Colorado has had the SQL-based MIS system operational since FY92. However, a new system, the MIS 2000, replaced an old system 10/01/04. Differences in the systems have changed some outputs such as requests for assistance. Thus, information will be given for FY07 to FY11 in this document. MIS reports will not be referenced in the Literature Cited Section since most reports from the MIS are not kept on file. A database is kept that allows queries to be made to retrieve the information needed.

[8] It is possible that this case may be appealed to the Supreme Court and if this occurs, WS would cooperate with the agency that has management authority for wolves in Montana and this EA would provide the analysis and overarching National Environmental Policy Act (NEPA) compliance for actions conducted under such a scenario.

rules and plans[9]). USFWS (2012*b*) summarizes relevant delisting and litigation activities that have transpired.

1.3 PURPOSE AND NEED FOR GWDM IN MONTANA

The purpose of this EA is to evaluate the potential impacts of alternatives for responding to complaints of wolf damage[10] in Montana. GWDM activities conducted by the Montana WS program up to this time have been carried out under National Environmental Policy Act (NEPA) documents previously prepared by the USFWS (USFWS 1994, 2008, 73 FR 4720-4736) and WS program categorical exclusions (CEs) (7 Code of Federal Regulations (CFR) 372.5(c)). The EAs prepared for these activities all resulted in Findings of No Significant Impact (FONSI) for all the proposed activities.

As wolf populations increase and expand their ranges, local decision makers must choose management strategies that balance competing needs for wolf protection and the reduction of wolf-caused damage (Mech 2001). Understanding the biology, impacts and benefits of wolves has increased since reintroduction and the NRM reintroduced "meta-population" is comprised of wolves in Montana, Idaho, and Wyoming. The original recovery EIS (USFWS 1994) analyzed potential impacts and benefits of 100 wolves in Montana, however the USFWS determined a biologically-recovered population was reached in 2002 with an estimated 43 breeding pairs and about 663 wolves in the tri-state Rocky Mountain Wolf Recovery Area, out of that an estimated 183 wolves in 17 breeding pairs were counted in Montana (USFWS 2012*b*). Currently an estimated NRM population of at least 1,774 wolves in more than 109 breeding pairs and an estimated population of 653 wolves in Montana (Hanauska-Brown et al. 2012). Because of the sustained growth of the gray wolf population in the NRM and Montana, and federal delisting, MFWP is challenged with gray wolf management and implementing strategies for GWDM. At least 1,774 wolves inhabit the metapopulation region, where wolves can travel freely to join existing packs or form new packs. Thus, there appears to be enough habitat connectivity between occupied wolf habitat in Canada, northwestern Montana, and Idaho to ensure exchange of sufficient numbers of dispersing wolves to maintain demographic and genetic diversity in the NRM DPS (Oakleaf et al. 2006, Carroll et al. 2006, VonHoldt et al. 2008, 2010). Wolf movements between Canada, Idaho and Montana have been documented from radio-telemetry monitoring (Pletscher et al. 1991, Boyd and Pletscher 1999, MFWP 2007, Hanauska-Brown et al. 2012) with routine wolf movement between Idaho and Montana, including several transborder packs, and at least five wolves have dispersed into the Greater Yellowstone Ecosystem (GYE). Thus, strategies that balance public demand for wolf conservation along with the need to protect livestock and other resources against wolf depredation are needed. In addition, finding effective strategies to reduce wolf depredation is beneficial for both resource owners and the long-term recovery of wolves (Fritts et al. 1992, Mech 1995, Bangs et al. 2005, 70 FR 1286-1311, 74 FR 15123-15188). MFWP's proposed strategies include preventive management, including nonlethal measures, reactive management (*i.e.*, wolf removal after depredation), population management through public hunting and or trapping, and the potential for "damage" hunts associated with chronic depredation areas similar to big game strategies (*i.e.*, wolves removed on a case specific basis) (J Herbert, MFWP 2011 pers. comm.). Haight et al. (2002) reported on results from model simulations to test these strategies: 1) each strategy reduced depredation by at least 40% compared with no action, 2) preventive and population-size management removed fewer wolves than reactive management because wolves were removed in winter before pups were born, 3) population-size management was least expensive because repeated

[9] This would include the USFWS 2008 10j rule (50 CFR 17.84) for experimental-nonessential wolves in Montana State boundaries of the GYE and the "Interim Wolf Control Plan for Northwestern Montana and the Panhandle of Northern Idaho" for endangered wolves (USFWS 2009).

[10] Damage as defined by Webster is to inflict physical harm on something so as to impair its value, usefulness, or normal functions, or to have a detrimental effect on something.

annual removal kept most territories free of wolves, and 4) none of the strategies threatened wolf populations unless they were isolated populations because wolf removal took place near farms and not in wild areas.

Another reason that GWDM continues to be needed in Montana is to comply with the commitment made by the Federal government when wolves were reintroduced and the issuance of 10j rules for management of the experimental, nonessential population (USFWS 2004, 59 FR 60252-60281, 70 FR 1286-1311, and 73 FR 4720-4736). At the time of the reintroduction of wolves to central Idaho and Yellowstone National Park (YNP), the USFWS addressed the issue of depredating wolves with this specific language: "*All chronic problem wolves (wolves that depredate on domestic animals after being moved once for previous animal depredations) will be removed from the wild (killed or placed in captivity)"* (50 CFR 17.84(i)(3)(vii)). This language did not specify that chronic depredating wolves "*may*" be removed from the wild, but that they "*will*" be removed from the wild. Clearly, the intent of USFWS and the rules under which wolves were reintroduced was not only to provide for the recovery and eventual delisting of wolves, but to also concurrently address the damage caused by wolves and to address concerns of livestock producers at the time when wolves were going to be reintroduced (59 FR 60252-6028, 70 FR 1286-1311, 73 FR 4720-4736).

Given these established rules, MFWP recognizes that the long-term future of wolves in Montana depends on carefully balancing the complex biological, social, economic, and political aspects of wolf management (GW Plans). MFWP considered the wide spectrum of interests in the design and implementation of wolf management that is responsive and addresses the challenges faced by people directly affected by wolves. Under the GW Plans, MFWP and Tribes have a commitment to keep livestock conflicts with wolves to a minimum, similar to management programs for other large carnivores and in the spirit of the reintroduction promises.

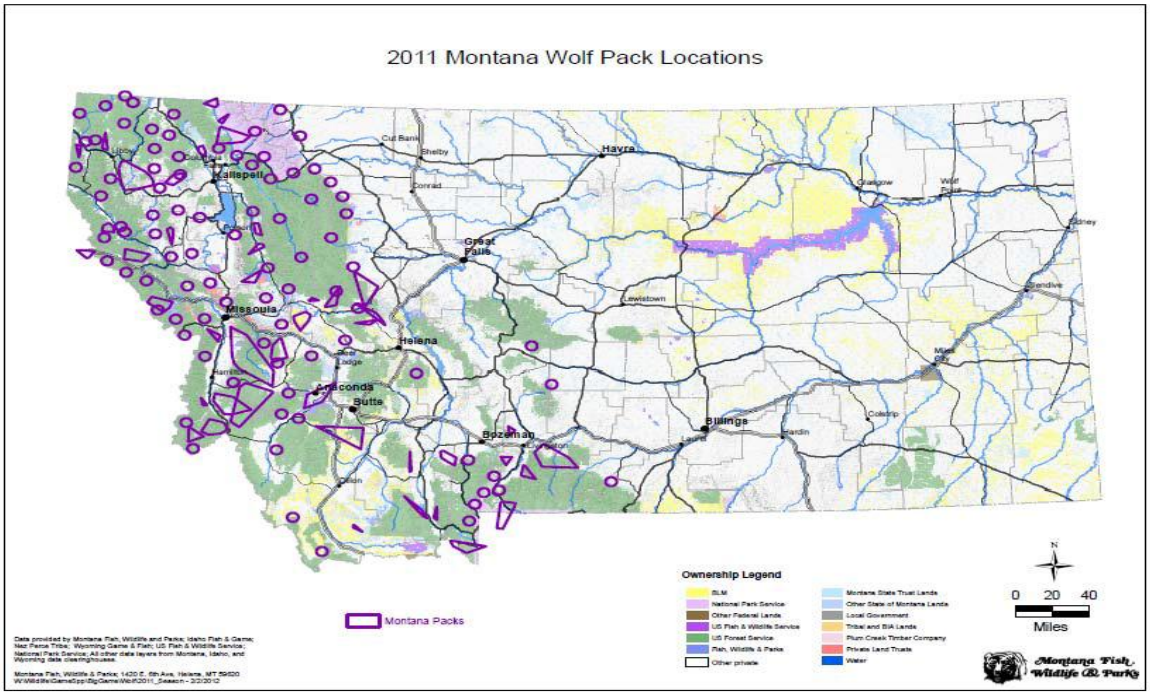
The Montana minimum wolf population increased about 8% from 524 wolves in 2009 to 566 in 2010 and increased 15% to 653 with 39 breeding pairs in 2011. This is more than 6 times the number of wolves analyzed for potential impacts and benefits in USFWS (1994). Further, a total of 21 new packs formed between 2010 and 2011 in Montana (Figure 1-1). The areas where new packs established or recolonized territories were more prone to conflicts with livestock and lethal management (Hanauska-Brown et al. 2012). The current population level is a concern to sportsmen who rely on surplus mule deer (*Odocoileus hemionus)*, white-tailed deer (*O. virginianus*), and elk for hunting[11], and livestock producers who use public and adjacent private land for livestock grazing.

To implement the GW Plans, whenever WS receives a report of suspected wolf depredation, or of wolves harassing/chasing livestock or livestock guarding animals, WS typically responds by sending a field specialist to conduct an on-site investigation. If the investigating WS agent determines that a wolf or wolves were responsible, management response will be guided by the specific recommendations of the investigator, the provisions of the GW Plans, and by the Memoranda of Understanding (MOUs) between MFWP, BN, and CSKT and WS. Results of each investigation are documented on WS Form, "Gray Wolf Depredation Investigation Report" (see Appendix A). WS discusses the report with MFWP, or other managing agency/Tribe, and upon their authorization WS will then, and only then, take an incremental approach to address wolf depredations, guided by wolf numbers, depredation history, and the location of the incident (GW Plans). Specific criteria have been agreed upon by the MFWP, USFWS,

[11] Harvest alone may not eliminate conflicts, but livestock depredations should decrease if harvest is focused on conflict areas or packs involved in depredations. MFWP Commission set 2011 hunting seasons and quotas to help resolve livestock conflicts, impacts on big game populations, maintain hunter opportunities, maintain viable and connected wolf populations (MFWP 2011*a*).

CSKT, BN, and WS to classify reported incidents of wolf depredation as either: confirmed, probable, possible/unknown or other (see reverse side of Appendix A for discussion of these criteria).

Figure 1-1. Verified wolf pack distribution in Montana, December 31, 2011.



1.3.1 Ecological Effects of Wolf Presence and Predation

In recent years, considerable research has focused on large herbivore population dynamics and predation, primarily elk and wolf, with emphasis in the NRM states on landscapes with minimal human impact (Hamlin et al. 2008). Wolf numbers have increased rapidly in all of western Montana since wolf restoration began in 1995, at rates of approximately 10% to 34% annually. In the range of the Northern Yellowstone elk herd, wolf numbers increased by an average of approximately 13% annually during 1995-2007. Initial investigations (Garrott et al. 2005) indicated that the effects of wolves on elk dynamics could vary considerably, making generalizations equivocal. Hamlin and Cunningham (2009) expanded this analysis to compare population dynamics among seven elk populations in the GYE. Within the GYE, wolves subsist on elk as their main prey (~ 85-90% of winter prey) with other ungulates such as white-tailed deer, mule deer, pronghorn (*Antilocapra americana*), and moose (*Alces alces)* making up a smaller proportion of the wolves prey base (Smith et al. 2004, Hamlin 2006).

Hamlin and Cunningham (2009) found that since 2004 in the northern YNP elk herd, wolves have killed more elk than hunters; since 2005 wolves killed more adult cow elk than hunters; and in all but 1-year since 2002, wolves have killed more bull elk than hunters. Their analyses of elk in the Northern Yellowstone elk herd indicate that a continued decline in elk numbers in coming years is likely until predator/prey ratios decline, even if hunting pressure remains low or is decreased further. Hamlin and Cunningham (2009) also spent 7 years measuring elk populations and behavior in Montana, and found that elk numbers in some areas of southwestern Montana dropped rapidly, mainly due to the loss of elk calves from wolf and grizzly bear (*Ursus arctos*) predation. However,

Hamlin and Cunningham also suggested that in some areas of western Montana, elk numbers have increased while the number of elk taken by hunters has decreased, and they found little apparent influence by local wolf packs on elk numbers in those areas. Hamlin and Cunningham stated that the seemingly contradictory results indicate that not all elk populations respond the same way when sharing the habitat with wolves.

Hamlin and Cunningham (2009) also noted that habitat, weather patterns, human hunting, and the presence of other large predators and livestock play a role in determining elk numbers and that wolf predation alone did not necessarily initiate declines in prey populations, but exacerbate a decline or lengthen the time needed for the population to rebound. Most data that have measured elk pregnancy rates since wolf restoration indicate that pregnancy rates are unaffected by wolves, in contrast to some indirect evidence from average hormone concentrations in elk feces; indirect evidence from hunter-collected samples have also indicated that elk pregnancy rates have been unaffected by wolves (Hamlin et al. 2008). Additionally, calf survival rates following wolf restoration in most of southwest Montana and the GYE have been similar to rates prior to wolf restoration (Hamlin and Cunningham 2009). Declines in calf per 100 cow ratios have occurred in the Northern Yellowstone, Gallatin-Madison, and Madison-Firehole elk herds, where both wolf and grizzly bear densities have been high. In the Northern Yellowstone and Gallatin-Madison elk herds, calf per 100 cow ratios have recently been approximately half or less than levels recorded prior to wolf restoration. In areas with high predator (grizzly bear and wolf):prey ratios, including the Northern Yellowstone, Gallatin Canyon, and Madison-Firehole winter ranges, elk numbers have declined substantially since wolf reintroduction. In most areas with lower predator:prey ratios, elk numbers have remained stable or have increased since wolf restoration began. In contrast, areas of southwest Montana and the GYE that have shown declines in elk calf survival, recruitment, and population size since the wolf reintroduction, mule deer recruitment and numbers have increased.

Wolves may also affect elk habitat selection and group sizes (Creel and Winnie 2005, Creel et al. 2005), but the magnitude and direction of these effects is widely variable among wintering areas and even among habitats in the same wintering area. Most data collected during winter indicate that wolves have small-scale effects on elk distribution and movement rates and the effect of wolves on large-scale elk distribution are equivocal. However, little or no indication that wolves affect larger-scale elk seasonal distribution or the timing of migration was found in some areas in southwest Montana (Hamlin and Cunningham 2009) even though anecdotal information suggested that this may occur in some other areas. Additionally, research data from the Madison-Firehole elk herd suggest that wolf predation pressure affects large-scale migration patterns or seasonal range selection for some elk.

Little data exists on moose populations in southwest Montana and the GYE due to inconsistent monitoring. Recruitment rates and population sizes appear to have declined in some areas, while numbers have increased in other areas (Hamlin and Cunningham 2009). However, moose numbers appear to be stable in the sole hunting district of Region 1 that has consistent, long-term data on the moose population trend. Using buck harvest as an index of population trend for white-tailed deer in most hunting districts, numbers have appeared to increase steadily from the large decline in 1996-97 until 2006. Recent highs were slightly lower than previous highs despite relatively smaller antlerless harvests, and the entire increase occurred during a phase of increasing wolf numbers. In the Madison Valley study area (Gude and Garrott 2003, Fuller and Garrott 2004, Grigg and Garrott 2005, Hamlin 2006), 87% of 234 wolf kills were elk, 9% were mule deer, and 3% were pronghorn. In the Northern Yellowstone area (Smith et al. 2004), determined that of the more than 2,500 wolf killed prey, 87% were elk, 5% bison (*Bison bison*), 2% moose, and 1% deer. Atwood et al. (2007) found that wolf kills were comprised of 70% elk, 26% white-tailed deer, and 4% mule deer on the north end of the Madison Mountains, within the GYE.

It appears that factors other than predation, however, played a role in recent white-tailed deer population declines in MFWP Region 1. Predation may have initiated the declines and prolonged the recovery periods by limiting total deer numbers below the previous highs. The complement of large predators likely contributes to observed white-tailed deer, elk, and moose dynamics (Kunkel 1997, Kunkel and Pletscher 1999). If white-tailed deer buck harvest level represents the overall white-tailed deer population trend, it appears that cycles of predator and prey abundance may develop in environments like Hunting District 110. In Hunting District 110, white-tailed deer numbers declined for 15 years after addition of wolves to the predator mix, but then apparently recovered to previous highs. However, predator numbers also fluctuated, and predation did not "hold" prey numbers permanently at lower levels. Monitoring of deer and elk populations in Montana is well covered by management plans and the Adaptive Harvest Management Program (Mackie et al. 1998, MFWP 2004). Smith et al. (2007) investigated wolf prey selection and kill rates from wolf scat collected during summer months. Data from these summer-collected wolf scats indicated lower occurrence of elk and higher occurrence of deer and moose than the proportions of observed kill by species during winter. In other areas aerial counts of elk have increased while harvest has decreased, with little apparent influence of wolves.

Further, there is evidence in YNP that, since wolf recovery, the elk population and elk use of riparian willow (*Salix* spp.) habitat has declined. Reduced elk use has allowed recovery of some willow habitats, thereby producing benefits to a wider range of wildlife (Ripple and Beschta 2004). Also, elk carcasses, resulting from wolf predation, are being scavenged by an array of other carnivores, potentially increasing species fitness of grizzly bears, red fox (*Vulpes vulpes*), common ravens (*Corvus corax*), and bald (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) (Smith et al. 2003).

Predation studies have also shown that prey selection by wolves favor young, old, or physically impaired wildlife (Mech et al. 2001, Husseman 2002, Smith et al. 2003). Strong selection for more vulnerable prey may result in mitigating effects of wolf impacts to prey populations due to the compensatory mortality component of wolf predation, or when wolves selectively prey on older, non-productive individuals that no longer contribute to population maintenance or growth.

1.3.1.1 Potential Role of Wolves in Disease Transmission to Wildlife and Livestock. Wolves in Montana are known to have exposure to a variety of diseases, including those caused by viruses (*e.g.*, canine distemper, canine parvovirus, and canine infectious hepatitis), bacteria, and both internal (*e.g.*, intestinal worms of various species, echinococcosis) and external (*e.g.*, lice and ticks) parasites (MFWP 2011*b*). A complete list of diseases that wolves in Montana could encounter would closely mirror diseases present in coyotes (*Canis latrans*), foxes (*Vulpes* spp.), and domestic dogs (*Canis familiaris*) in the state. Those animals that interact with domestic dogs are likely to have higher exposure rates than wolves in remote areas. Wolf populations have the opportunity to develop individual and pack level immunity to some of the common pathogens over time, some of which may be conferred to offspring through maternal antibodies (Gillespie and Timoney 1981). Although diseases can be significant sources of mortality for wolves, they are generally not considered to be limiting at the population level. Despite evidence of ubiquitous exposure, wolves in Montana demonstrate high recruitment, suggesting long-term stability of the population. Negative effects associated with diseases are unlikely unless the population reaches a high density (Kreeger 2003).

The protozoan parasite, *Neospora caninum*, causes abortions in cattle and has been shown to be a large economic loss to the dairy and beef industry with infected animals being three to thirteen times more likely to abort than non-infected cattle (Hall et al. 2005, Trees et al. 1999). Presently, domestic dogs and coyotes are the only two species that have been determined to be able to host and transmit

N. caninum (Gondim et al. 2004*a, b*). Canids become infected by ingesting tissues (placenta, fetuses) contaminated with the organism. They then shed the organism in their feces. A cow grazing on a pasture contaminated with these feces can become infected with *N. caninum* (Dubey 2003). Gondim et al. (2004b) indicated that 39% (n = 164) of wolves from Minnesota and 11% of coyotes in Utah, Colorado, and Illinois (n = 113) tested positive for exposure to *N. caninum*. Research in Minnesota is currently being conducted to determine if wolves can also transmit viable *N. caninum* in their feces. Although wolves may prove to be hosts capable of transmitting *N. caninum,* it is unclear whether the presence of wolves would add to the risk already posed by other canids. Data on the rate of seroprevelence of coyotes, dogs, and wolves needs to be defined for a particular geographic region before conclusions can be drawn (Gondim et al. 2004*b*).

During winter 2009, 17 wolves captured near Jackson, Wyoming were tested for two strains of Brucellosis (*Brucella canis* and *B. abortus*). All 17 wolves tested negative for *B. canis* and 15 wolves tested negative and 2 positive for *B. abortus.* To put these test results in perspective, the Supervisory Veterinarian for the Wyoming Game and Fish Department (T. J. Kreeger, DVM, PhD) (USFWS Wyoming Gray Wolf Recovery Status Report, May 11 –May 15, 2009) offered the following comments: "A positive serology titer for *B. abortus* in a wolf means that the wolf had been infected with the bacteria sometime in the past (probably in the last 12 months) and developed an immune response reflected in the antibodies measured by the diagnostic tests. A positive test does not mean that the wolf is currently infected with living bacteria, although it could be. How a wolf became infected by *B. abortus* is speculative. Possible ways of becoming infected include: 1) consumption of a fetus aborted by an infected elk or bison; 2) consumption of an adult, pregnant, infected elk or bison (particularly consumption of the reproductive tract); and, though unlikely sources 3) consumption of an adult, infected, but not pregnant elk or bison; or 4) contact with the environmental site of an aborted fetus. Wolves can become infected with *B. abortus* and transiently shed the bacteria in the feces, although the amount of shed bacteria is thought to be insufficient to infect cattle, elk, or bison" (USFWS 2009).

Foreyt et al. (2009) documented that the tapeworm *Echinococcus granulosus* occurred in 62% of wolves examined in Idaho, and that it was common to find thousands of these tapeworms in each infected wolf. *E. granulosus* requires two hosts to complete its life cycle. Ungulates such as (deer, elk, moose, domestic sheep, and domestic cattle) are intermediate hosts for larval tapeworms which form hydatid cysts in the body cavity, often on the liver or lungs. Canids such as (dogs, wolves, coyotes and foxes (*Vulpes, Urocyon* and *Alopex* spp.) are definitive hosts where larval tapeworms mature and live in the small intestine. Definitive hosts are exposed to larval tapeworms when ingesting infected ungulates. Adult tapeworms, 3-5 mm long, produce eggs which are expelled from canids in feces. Intermediate hosts ingest the eggs while grazing, where the eggs hatch and develop into larvae. Humans are at risk of becoming infected and developing hydatid cysts, primarily through ingestion of eggs which may be present on the fur of infected dogs, wolves or other canids. In Idaho, at least three reports of human infections with *E. granulosus* are known; the earliest dating back to 1938. Throughout the world, most human cases occur in indigenous people with close contact with infected dogs, but hunters and trappers handling wolves, coyotes or foxes may be at increased risk (MFWP 2012).

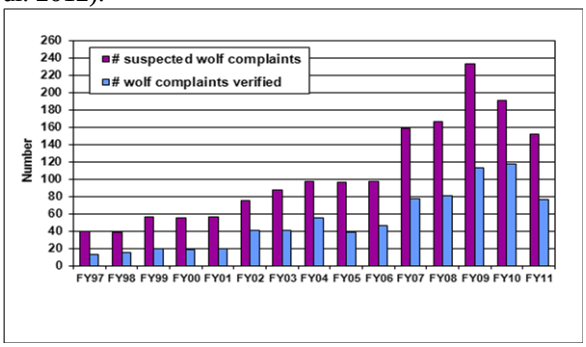
1.3.2 GWDM to Protect Livestock and Other Domestic Animals

A successful wolf management and livestock conflict reduction program should include: 1) proactive nonlethal efforts, 2) population reduction directed by MFWP in high conflict are as using primarily sport hunters, 3) removing depredating wolves using professional field specialists, and 4) compensation for losses. Management of wolf depredation on livestock has been a significant segment of overall wolf management since reintroduction. As wolf conflicts continue to occur,

prompt professional wolf damage management assistance to maintain public tolerance and acceptance of wolves is needed (Fritts and Carbyn 1995, Mech 1995, Boitani 2003, Fritts et al.2003, 73 FR 10514). However, most wolves in Montana routinely encounter livestock, but do not kill livestock at each encounter.

On average, 10-25% of Montana wolf packs were confirmed to have predated livestock in any given year (MFWP 2010). In 2010, an average of 35% of packs has been confirmed livestock depredators (MFWP 2011*b*). However, in 2011, total confirmed livestock losses were down with about 17% of the packs having been confirmed to have killed livestock (Hanauska-Brown et al. 2012). This is down from 31% in 2010 and resulting in markedly fewer wolves removed from agency management actions (Hanauska-Brown et al 2012). Packs that have killed livestock repeatedly and within short periods of time, particularly adult-sized livestock, eventually became sources of chronic conflict and management actions are initiated (MFWP 2011*b*). Occasionally, livestock were confirmed killed by lone dispersing wolves or a pair of wolves passing through, as evidenced by the lack of a resident pack or subsequent instances of injured or dead livestock or wolf sign in the area.

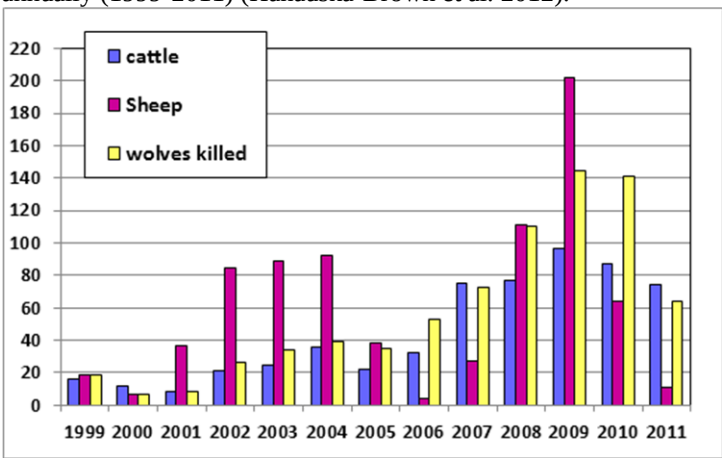
Figure 1-2. Number of complaints received by WS as suspected wolf damage and complaints verified as wolf damage, FY 1997 – 2011 (Hanauska-Brown et al. 2012).



The trend in confirmed and probable losses of livestock due to wolf depredation has been variable since wolves were reintroduced (Table 1-2, Figure 1-2). The decrease in livestock depredations in FY11 may be a result of several factors, including GWDM in response to livestock depredations in FY09 and FY10 may have decreased wolf numbers in certain chronic areas and led to decreased conflicts in 2011 (Hanauska-Brown et al. 2012). In calendar year 2011, WS confirmed that 74 cattle, 11 sheep, 2 domestic dogs, and 1 horse were killed by wolves statewide. Total confirmed losses were down considerably from 2010 levels and were the lowest recorded in the last five years. As WS only conducts GWDM as requested and on as-needed basis, WS actions were also markedly lower as a result (Figure 1-3).

WS also confirmed 22 cattle were confirmed injured by wolves. Eighteen dead calves and 1 injured calf were considered probable wolf depredations in 2011. Furthermore, many livestock producers reported "missing" livestock and suspected wolf predation. Others reported indirect losses including poor weight gain and reduced productivity. Undocumented losses are a certainty (Hanauska-Brown et al. 2012).

Figure 1-3. Number of wolves removed through agency control and take by private citizens, number of cattle and sheep killed annually (1999-2011) (Hanauska-Brown et al. 2012).



In northwest Montana, the number of confirmed livestock has been on

a 2-year decline as livestock availability varies widely among packs, and the majority of packs have few, if any, of livestock present within pack home ranges. The number of confirmed packs in 2011 increased 24%, but the number of packs involved in livestock depredations decreased from 17 in 2010 to 8 in 2011. Thirty-five livestock (*i.e.*, 29 cattle and 6 sheep) were confirmed killed by wolves in northwest Montana in 2011. An additional 7 calves were ranked as probable kills and 4 cattle were confirmed injured. The number of wolves lethally removed decreased from 61 in 2010 to 17 in 2011. Nonlethal measures ranging from range riders to aversive tools such as Radio Activated Guard boxes and fladry were routinely deployed where applicable and as available. A range rider was utilized in Arrastra Creek, Garnet, and Ovando Mountain packs. Fladry was used on the Benchmark, Belmont, Monitor Mountain, and Ovando Mountain packs (Hanauska-Brown et al. 2012).

In western Montana, 9 packs were confirmed to have killed livestock or dogs: Anaconda, Bannack, Divide Creek, Lake Como, Stewart Mountain, Pintler, Trapper Peak, Twin Lakes, and Ross' Fork. Single or unknown wolves were responsible for killing 7 calves and 1 sheep. In total, 21 cattle, 3 sheep, 1 dog and 1 horse were confirmed killed. Four cattle were confirmed injured and 5 calves were documented as probable wolf kills (Hanauska-Brown et al. 2012).

In southwest Montana in 2011, 5 of the 22 packs that did exist at one time during the year (23%) were confirmed to have killed livestock, resulting in the removal of 20 wolves. This represents a small decrease in the number of packs involved in depredation incidents from 2010. A total of 24 cattle were confirmed as wolf kills, 8 of which were killed by lone/miscellaneous wolves. Of the total sheep death loss confirmed statewide in 2011 (*i.e.*, 12 total sheep), about 17% of the death loss was attributed to miscellaneous lone wolves in the Montana portion of the GYE (Hanauska-Brown et al. 2012).

It is important to recognize that the numbers in Tables 1-1 and 1-2, and Figure 1-2 represent only the minimum numbers of livestock actually killed by wolves, and that more livestock were probably killed, but not confirmed as wolf predation or missing (Bjorge and Gunson 1985, Oakleaf 2002, Oakleaf et al. 2003, Hanauska-Brown et al. 2012). Wolf predation is only positively confirmed in those cases where enough evidence remains to determine that wolves in fact killed the animal. In many cases, wolves may have been responsible for the death of livestock, but insufficient evidence remains to confirm wolf predation. In some cases, those portions of the livestock carcass that might have contained the evidence of predation have already been totally consumed or carried off. Some of these incidents were classified as "probable" predation, depending on other remaining evidence. In many cases there may be little or no evidence of predation, but wolves are known to be in the area and some livestock have seemingly disappeared. Oakleaf et al. (2003) conducted a study on wolf-caused predation losses to cattle on USFS summer grazing allotments in the Salmon, ID area, and concluded that for every calf found and confirmed to have been killed by wolves, there were probably as many as eight other calves killed by wolves but not found by the producer. Bjorge and Gunson (1985) likewise recovered only one out of every 6.7 missing cattle during their study, and suggested that wolf-caused mortalities were difficult to detect.

Between 1987 and 2011, most confirmed cattle depredation events in Montana occurred in spring (March, April, and May) when calves were small and most vulnerable. A smaller spike occurred in the fall (September and October) presumably as food demands of the pack increased and pups were traveling with the pack. In addition, wild ungulates were still well dispersed on summer range and young-of-the-year ungulates were more mobile. Most confirmed sheep depredation in Montana occurred in July, September, and October (MFWP 2007, 2010). Because of their smaller size relative to cattle or other classes of livestock, sheep are vulnerable to wolf predation year round.

Many of the confirmed incidents of wolf predation on livestock in Montana have involved one to a few animals killed or wounded per incident. However, situations where a much larger number of livestock have been killed in a single incident, particularly in the case of wolf attacks on sheep. In August 2009, for example, WS personnel confirmed wolf predation on 82 sheep (rams) in a single incident near Dillon, Montana, and an additional 40 sheep (rams) were determined to be probable wolf kills (MFWP 2009).

Although direct losses of livestock due to predation are often conspicuous and economically significant, they likely underestimate the total impact on producers because they do not consider indirect effects as a result of livestock being exposed to the threat of predation (Howery and DeLiberto 2004, Lehmkuhler et al. 2007, Hanauska-Brown et al. 2012). Shelton (2004) suggested that the value of livestock killed by predators is the "tip of the iceberg" in assessing the actual costs that predators impose on livestock and producers including time and effort spent looking for missing livestock, and increased costs associated with efforts to mitigate predation which may include night confinement, improved fencing, additional livestock guarding animals, early weaning, choice of grazing area, or increased feeding costs related to loss of grazing acreage.

Further, harassment by predators may directly cause weight loss in livestock due to increased energy expenditures associated with running and loss of sleep. Indirect weight loss may also occur due to a reduced ability of ruminants to convert plant nutrients into weight gain due to decreased rumination time (Howery and DeLiberto 2004). Cattle and sheep exposed to harassment by predators become very skittish and spend much of their time being vigilant for predators (Kluever et al. 2008). They do not disperse and feed normally and, therefore, may not take in the quantity and quality of feed they would have if unstressed. This can result in reduced weight gains by the end of the grazing season. Additionally, cattle are sometimes stampeded through fences and injured when wolves are actively chasing them, and the stress of being repeatedly chased can also cause cattle to abort calves, calve early, or give birth to weak calves (Lehmkuhler et al. 2007).

Some wolf advocacy groups have pointed out that only a very small proportion of livestock losses (<1%) nationwide are typically caused by wolves and that other predators, such as coyotes, are responsible for many more livestock deaths (Defenders of Wildlife 2012). While both of these are valid points, it is also important to recognize that even though predation losses due to wolves represent a relatively minor portion of total overall death losses nationwide, these losses are never evenly distributed across the industry (Mack et al. 1992). Most livestock producers will experience no predation by wolves, while some producers in certain areas may suffer significant losses to wolves. Coyotes do cause more overall predation losses by virtue of the fact that their population is many times greater and more widely distributed than the wolf population

Assessing the relative likelihood of predation by individual wolves versus individuals of other common livestock predators provides insight as to why wolf predation is a bigger concern to some livestock producers and wildlife damage management (WDM) agencies than is predation by other species. Collinge (2008) compared reported numbers of livestock killed by wolves and other predators with the estimated statewide populations of the four species most often implicated in predation on livestock in Idaho (*i.e.*, coyotes, wolves, mountain lions (*Puma concolor*), and black bears (*Ursus americanus*)). Determining the average number of livestock killed per each individual predator on the landscape, and comparing these figures among the four species, shows that wolves in Idaho are about 170 times more likely to kill cattle than are individual coyotes or black bears. Individual wolves were determined to be about 21 times more likely to kill cattle than were individual mountain lions. These comparisons highlight the importance of being able to implement effective GWDM procedures.

Domestic dogs and cats are also occasionally killed and eaten by wolves (Fritts and Paul 1989, Treves et al. 2002). The dogs most often attacked by wolves in Montana are typically either livestock guarding dogs or hunters' hounds which sometimes encounter wolves during the legal sport hunting seasons for mountain lions. (MFWP 2007, 2010) These dogs are often highly valued animals, both from a monetary standpoint and in terms of the human-social bond. Individual livestock guarding dogs may be worth more than $1,000 each, and individual lion hounds are often valued at several thousand dollars for well trained and experienced animals. Wolves have also occasionally killed or injured pet dogs near homes in Montana and other states, sometimes in the presence of the nearby owners.

1.3.3 GWDM to Protect Human Safety

As specified in state law (MCA §87-3-130; Administrative Rules of Montana (ARM) §12.9.1301-1305), lethal removal of wolves to protect private property will be allowed under specific circumstances, including self-defense (MGWCM). As is the case with other species, a permit to lethally remove problem wolves may be required. There have been few reported wolf attacks on people. However, there are reports where wolves have been viewed as threatening to humans or have stalked and attacked people for unknown reasons (*e.g.*, reasons unrelated to disease or injury) (Linnell et al. 2002, McNay 2002). When wolves approach human residences and threaten or kill people's pets or exhibit bold behavior, people often become concerned for human safety. This is especially true if small children are present at those residences.

Fatal wolf attacks on humans are a rarity, but it does happen as two documented fatal attacks on humans by wolves in North America have occurred in recent years. In November 2005, a coroner's jury in Saskatchewan determined that an Ontario university student was killed in a wolf attack near Points North (McNay 2007). The student was 22 when he died while on a work term for a company at the mining exploration camp. In March 2010, investigators determined a 32-year-old school teacher was killed in a wolf attack in Chignik Lake, Alaska (MSNBC 2010). In both cases, evidence suggested several local wolves had become habituated to people, and the victims were attacked while in a wooded area. The wolves had been feeding on the victim's body before searchers found the remains. Linnell et al. (2002) reported several cases from around the world in which non-diseased wolves attacked and injured people. The wolves in most cases were later killed and examined. The wolves involved in those attacks seemed to have acclimated to the presence of people and had become more aggressive toward humans. Fortunately, in many of these incidents, other people accompanying the victims were able to drive the wolf away. In many cases the person attacked received only minor injuries and made a full recovery in a few days to weeks.

Wolves have not attacked and injured or killed any people in the lower 48 United States. However, McNay (2002) reviewed known case histories of incidents where wolves had behaved aggressively towards humans in Alaska and Canada. The author noted that incidents of wolves behaving aggressively towards humans are extremely rare, and that for much of the 20th century no documented cases of wolves killing or seriously injuring a person in North America existed. McNay (2002) provided case histories for 11 instances of what he considered unprovoked incidents of aggressive behavior by wolves which resulted in no injury (n=4) or minor injuries (n=7) over the period of 1969-1993. He found evidence of seven cases of unprovoked wolf aggression over the period of 1994-2000, five of which involved wolves inflicting severe bites on humans.

In January of 2005, an individual was attacked by a wolf while jogging near the community of Key Lake in northern Saskatchewan, Canada. The man was able to fight off the animal and later was flown to a hospital for stitches to non-life threatening injuries. In July 2007, a kayaker in a remote area of the North Coast in British Columbia, Canada was attacked by an old female wolf (Pynn

2007). The kayaker was able to stop the attack by repeatedly stabbing the wolf with a knife. The individual called for help on his marine radio and the wolf was shot by the individuals who came to rescue the kayaker. In this instance, there was no indication that the wolf had been fed or otherwise habituated to humans.

McNay (2002) reported that in most instances where naïve wolves behaved aggressively toward humans, the humans defended themselves by hitting the wolf with a heavy object, firing a rifle into the air or, in two instances, killing the wolf. None of the individuals who were bitten by habituated wolves defended themselves with anything other than their voices, hands or arms. It was difficult to determine if food conditioning (*i.e.*, wolves learning to associate humans with the availability of food) played a role in all cases, but in at least 6 of the 11 cases, wolves were known to be food conditioned. It was unlikely that the naïve wolves were food conditioned because all of those incidents occurred at sites well away from human-use areas. With a growing wolf population and many people living in occupied wolf range, opportunities for wolves to become habituated to humans increases as does the risk of adverse interactions between humans and wolves. The data provided by McNay (2002) indicates the importance of human behavior management and public education programs in the prevention of adverse human-wolf encounters. These efforts coupled with nonlethal techniques designed to reduce or prevent wolf habituation to humans will likely prevent or resolve most situations where wolf behavior causes concern for human safety. However, instances may occur where the removal of a bold, habituated wolf may be deemed necessary to reduce a human safety risk. This is anticipated to be a minimal number and likely occur, at most, once or twice in the span of several years.

Wild wolves rarely contract rabies, but it is possible; an encounter with a rabid wolf is a serious concern for humans and their pets should they be bitten. McNay (2002) reported two people that died as result of bites from wolves with rabies in Alaska in the 1940s. In 2007, a pack of wolves attacked a group of sled dogs and strays in Marshall, Alaska (Pemberton 2007). The one wolf that was killed by villagers during the attack tested positive for rabies. All dogs involved in the incident were euthanized as well as free roaming dogs that may have been involved in the incident. In response, villagers and government officials were working to increase use of rabies vaccine and fenced enclosures for dogs. However this type of incident is relatively uncommon and rabies is rare in wolves south of the arctic in North America.

1.4 ECONOMIC IMPACTS OF WOLVES

A visitor survey conducted in YNP comparing pre-wolf visitation and post-wolf visitation during 2005 indicated that the direct spending impact of wolf presence in the GYE amounted to about $35.5 million annually (Duffield et al. 2006). Consequently, some increase in economic benefits is recognized in the gateway communities of YNP. Several outfitters operate wolf viewing trips into YNP. In Montana, wolf viewing has yet to provide significant economic benefit for the state. Some outfitters have offered wolf viewing opportunities, but indicated it was not a lucrative portion of their business. Also, according to outfitters, changes in elk behavior attributable to wolves have negatively impacted specific operations (MFWP 2009).

Trends in some elk populations in the state may dictate reductions in elk hunting opportunity as it has in Montana north of YNP. Further, some hunters have indicated that they would not return to their hunting areas because of real or perceived impacts of wolves. This change in hunter activity is difficult to assess.

In 2009 when MFWP held the first wolf hunt with a quota of 75 wolves, more than 15,000 wolf licenses were sold, resulting in approximately $320,000 in new license revenue for MFWP. In a survey of wolf license holders, 93% of the people who purchased a license in 2009 indicated they would purchase a wolf

license again. In 2011 MFWP held its second annual wolf hunt and sold 18,689 wolf tags generating revenue of $407,389.

1.4.1 Montana Livestock Loss Board

Livestock producers have absorbed most of the financial impacts of wolf recovery through uncompensated predation losses, reduced productivity related to stress on livestock, and increased personnel costs associated with livestock protection and management (MFWP 2008). Compensation in Montana comes in the form of reimbursement by the Montana Livestock Loss Board (MLLB) which was created by the 2007 Montana Legislature to fulfill the compensation provisions of the 2003 GW Plan. The program is based on the beliefs that both government and livestock producers want to take reasonable and cost-effective measures to reduce losses, that livestock owners should not incur disproportionate impacts as a result of recovery of Montana's wolf population, and acknowledge that it is not possible to prevent all losses from occurring. The source of funding for compensation payments has been primarily state general fund. As a State operated program, the MLLB has a Trust Fund that can be funded with tax deductible gifts, grants, appropriations, or allocations from any source per Internal Revenue Service section 170(c)(1). This is similar to a 501(c) (3) private nonprofit organization. Animals covered by this program are cattle, swine, horses, mules, sheep, goats, llamas and livestock guard animals. At this time, October 1, 2012, confirmed and probable losses are reimbursed at an amount not to exceed the fair market value. Confirmed and probable loss determinations are made solely by WS. Additionally, it should be noted that the Tribes do not assume responsibility of depredations, but assist livestock producers on reservations with trying to obtain compensation for losses through primarily MLLB where allowable, or private organizations that have reimbursement programs, if available. From 2008 to 2011, an average of 220 livestock annually was compensated at a cost to MLLB of just over $100,000 (MLLB 2012).

1.4.2 Non-Consumptive Use of Wolves

During 2006, 71 million U.S. residents, 31% of the U.S. population 16 years old and older, participated in wildlife-watching activities. People who took an interest in wildlife around their homes numbered 68 million, while those who took trips away from their homes to wildlife watch numbered 23 million people (USFWS 2006). A primary finding indicates that nature-related tourism and recreation are growing trends nationally, regionally, and within the State of Montana. A higher percentage of Montana residents participate in nature related recreation and, in particular, hunting, fishing, and wildlife viewing, than in other states. Non-resident travel is also closely linked to wildlife and fish resources and wildlife viewing is one of the top two reasons for travel to Montana. Expenditures for travel/tourism in the State are greatest around Glacier National Park and YNP, but throughout the west and central front, non-resident expenditures are significant. The 9.8 million visitors to Montana represent 10 times Montana's resident population and result in 43,300 jobs for an economic impact of $2.75 billion. While participation in hunting is declining slightly nationally, the percent of the population participating in hunting in the Rocky Mountain Region and Montana is significantly larger than the nation as a whole (8% nationally, 12% in the Rocky Mountain West and 33% in Montana).

Although potential participation in wolf viewing is unknown, respondents to a random survey in Idaho indicated that 42% of non-hunters would travel to see a wolf and 20% of non-hunters would pay an average of $123 to an outfitter to see a wolf (median = $100) (Idaho Department of Fish and Game (IDFG) 2008). In the same survey, 20% of hunters said they would travel to see a wolf, and on average would pay $115 to an outfitter to see one (median = $100).

Wildlife viewing areas are popular among the public and wildlife viewing is a growing pastime among Americans (USFWS 2006). Viewing big game animals such as deer and elk is common and especially popular when they are easily viewed from roads. Large ungulate viewing occurs despite annual hunting seasons. Similarly, such viewing opportunities may be available for wolves throughout the state despite annual hunting. However, as is the case with other large predators, viewing opportunities will be naturally infrequent and seasonal because these species occur at relatively low density, are secretive and highly mobile. Developing watchable wildlife areas would require consensus with landowners and other affected interests.

1.5 WS PROGRAM, MONTANA WOLF MANAGEMENT, AND SUMMARY OF PROPOSED ACTION

WDM, a specialized field within the wildlife management profession, is the science of reducing damage or problems wildlife can cause, and is recognized as an integral part of wildlife management (Berryman 1991, The Wildlife Society 2010). The WS program is authorized and directed by Congress to conduct wildlife management to protect American agricultural, industrial and natural resources, property, and human health and safety from damage associated with wildlife (Act of March 2, 1931 as amended 46 Stat. 1486; 7 U.S. Code (USC) 426-426c). WS is a cooperatively funded, service-oriented program that provides assistance to requesting public and private entities and government agencies. Before WS responds to requests for assistance and conducts any management, a request must be received and an *Agreement for Control* must be signed by the landowner/administrator for private lands or other comparable documents for public lands must be in place. WS responds to requests for assistance when resources are damaged or threatened by wildlife. Responses can be in the form of technical assistance or operational damage management depending on the complexity of the problem and funding that is available. WS activities are conducted in accordance with applicable Federal, State and local laws, cooperative agreements, "Agreements for Control", MOUs, and other applicable documents (WS Directive 2.210). These documents establish the need for the requested work, legal authorities and regulations allowing the requested work, and the responsibilities of WS and its cooperators.

This EA is being prepared to evaluate and determine if the proposed action or possible alternatives are likely to have any potentially significant or cumulative adverse impacts on the human environment[12]. All WS activities are undertaken in compliance with relevant laws, regulations, policies, orders and procedures, including the ESA of 1973, as amended (16 USC 1531-1543), the 2003 GW Plan[13], Tribal GW Plans, and state law and administrative rules for gray wolves (MCA §87-5-131). For the management of wolves found in Montana, MFWP adopted and implemented the 2003 GW Plan which addresses wolf conservation and management anywhere wolves occur in the State, except where management authority is explicitly reserved to other jurisdictions, such as Montana's Indian tribes[14]. The 2003 GW Plan resulted in a management and conservation plan which is implemented through the combined decisions and actions of the MFWP Commission, the seven MFWP administrative regional offices, MFWP's headquarters in Helena, MDOL, WS, local law enforcement or county authorities, and

[12] Normally, according to APHIS procedures implementing the National Environmental Policy Act (NEPA), individual management actions considered in this analysis could be afforded a CE [7 CFR 372.5(c), 60 FR 6,000, 6,003 (1995)].

[13] A 12-member Wolf Management Advisory Council consisting of a mix of livestock producers, hunters, educators, outfitters, conservationists, and other citizens, worked for 7- months to develop 26 "Guiding Principles" organized in four broad subject areas that address the public interest, public safety, maintaining wildlife populations and protecting the livestock industry. An Interagency Technical Committee advised the council, providing scientifically based information about biological, technical, legal, or financial aspects of wolf conservation and management. The Technical Committee also helped the council identify and assess challenges associated with implementing overall management strategies or specific management actions. It was comprised of wolf experts and resource managers from the National Park Service, USFWS, USFS, MFWP, and WS.

[14] Montana's Indian tribes have jurisdiction for wildlife conservation and management programs within reservation boundaries. MFWP and WS coordinate with tribal authorities on issues of mutual interest.

other cooperators. Montana statutes describe the legal status and management framework for wolves. Title 87 pertains to fish and wildlife species and oversight by MFWP. Title 81 pertains to MDOL and its responsibilities related to predator control. Montana statutes assign joint responsibility to MFWP and MDOL for managing wildlife that causes damage to livestock (the 2003 GW Plan). The Tribal GW Plans address wolf conservation on their reservation lands. Through a cooperative agreement with MDOL and MOUs with MFWP, BN, and CSKT, WS conducts field investigations and management activities in cases of damage caused by wildlife such as mountain lions, bears, coyotes, and now gray wolves. Wolf management authority currently resides with MFWP and the Tribes, but has the possibility of being under USFWS should relisting occur.

Under the Proposed Action Alternative, in this case the No Action Alternative as defined by the Council on Environmental Quality (CEQ) for ongoing programs and the Preferred Alternative, WS would continue the current program of adaptive GWDM to respond to complaints of wolf damage to livestock and other domestic animals, and to protect human health and safety. Under the Preferred Alternative, WS would use or recommend the full range of legal, practical and effective nonlethal and lethal methods for preventing or reducing wolf damage while minimizing any potentially harmful effects of damage management measures on humans, wolf populations, other species and the environment. Management strategies would be developed for individual situations by applying the WS Decision Model (Slate et al. 1992). When appropriate, ranch management practices (animal husbandry), frightening devices and livestock guarding animals would be recommended and used to reduce wolf damage to livestock. In other situations, WS might potentially use foothold traps, snares, ground shooting, denning[15], chemical immobilization and euthanasia and aerial gunning to remove individual problem wolves.

In determining the most appropriate damage management strategy, preference would be given to nonlethal methods when they are deemed practical and effective (WS Directive 2.101). Lethal methods would be used to reduce damage after practical and appropriate nonlethal methods have been considered and determined to be ineffective or inappropriate in reducing damage to acceptable levels (see section 3.3 and 3.4 for more discussion). However, nonlethal methods may not always be applied as a first response to each damage problem. The most appropriate initial response to a wolf damage problem could be a combination of nonlethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy.

1.6 RELATIONSHIP OF THIS EA TO OTHER ENVIRONMENTAL AND MANAGEMENT DOCUMENTS

1.6.1 WS Programmatic EIS

WS issued a programmatic EIS which analyzed all WDM activities conducted by the WS program (USDA 1997) and a Record of Decision for the programmatic EIS was issued in 1995. This EA incorporates information by reference from USDA (1997).

1.6.2 Final EIS on the Reintroduction of Gray Wolves to Yellowstone National Park and Central Idaho

The USFWS (1994) issued a Final EIS and Decision regarding the potential impacts of reintroducing wolves to YNP and Central Idaho. Part of the analysis in the EIS assessed potential impacts of a fully-recovered wolf population on livestock, big game populations, and hunter opportunity. This

[15] Denning, for wolf damage management in Montana, is defined as the removal of wolf pups from a den for humane purposes, after WS has been requested to remove a wolf pack.

EIS also assessed the anticipated impact of wolf removals for protection of livestock. Relevant analysis from USFWS (1994) is incorporated by reference in this EA.

1.6.3 Environmental Assessment for Proposed Revision of Special Regulation for the Reintroduction of Gray Wolves into the Central Idaho and Yellowstone Areas

The USFWS (2008) issued a Final EA and Decision in January 2008 (73 FR 4720-4736) on proposed changes to the 2005 10j rule [50 CFR 17.84(n)] which would allow greater flexibility in managing wolves that had been shown to be impacting ungulate populations. The USFWS (2008) assessed ecological and other impacts related to the potentially increased take of wolves for protection of ungulates and people's dogs. The Proposed Action in this EA includes some of the same GWDM activities which were analyzed in USFWS (2008), and relevant analysis from that document is incorporated by reference in this document.

1.6.4 Montana Gray Wolf Conservation and Management Plan

Montana Governor Marc Racicot convened Montana's Wolf Management Advisory Council. The 12-member Wolf Management Advisory Council produced a report and Montana Governor Judy Martz directed MFWP to use it to frame a wolf management plan. In response, MFWP prepared the 2003 GW Plan. It was approved by the USFWS in 2004. The goal of the 2003 GW Plan is to ensure the long-term survival of wolves in Montana while minimizing wolf-human conflicts that result when wolves and people live in the same vicinity. WS wolf management actions, included in the Proposed Action of this EA, would be consistent with the 2003 GW Plan.

1.6.5 Tribal Gray Wolf Conservation and Management Plans

The BN and CSKT Tribes have management plans for gray wolves on their lands which were approved in 2008 and 2009, respectively. The goal of the Tribal GW Plans was to address wolf conservation on their lands, conflict management, wolf harassment, capture, and take, and, research and monitoring, among other things. Both Tribes determined that while wolf numbers and restoration is important, the reservations are too small to specify a number that would be maintained. However, the Tribes work with MFWP to ensure the long term viability of wolves in Montana.

1.6.6 Memorandum of Agreement (MOA) Between the Secretary of the Interior, Through the USFWS, and the State of Montana

The MOA facilitated an orderly transition from federal management to state management and to further enhance the conservation of the gray wolf. Under the 10(j) rule, and this agreement, MFWP became the designated agent within the experimental, nonessential population area and northwest Montana for the State. A permit under ESA Section 10(a)(1)(A) allowed Montana to manage wolves in 2004. Montana assumed lead wolf management authority as described in the MOA under both management regimes. Montana began to implement it's federally approved the Montana Gray Wolf Conservation and Management Plan of 2003 (the 2003 GW Plan) to the extent possible as permitted by the 10(j) rule. For endangered wolves found in Northwest Montana, Montana employed the 1999 Wolf Control Plan in accordance with the Section 10(a)(i)(A) permit. At this time MFWP began close coordination with WS to investigate and resolve wolf-livestock conflicts. MFWP, or Tribe, is the primary wildlife manager for the state and WS wolf management actions, including the Proposed Action in this EA, would be consistent with the above mentioned MOA and ESA sections or agreement with a Tribe.

1.6.7 MOU Between MFWP and WS

The most recent version of this MOU was signed in 2007. It outlines the roles and responsibilities of MFWP and WS in dealing with a variety of wildlife damage problems in Montana, including wolf damage problems. GWDM post-delisting is directed by an MOU between WS and MFWP. Any actions conducted under either the Proposed Action or Alternative two would be consistent with the guidance in this MOU. Additional protocol, effective March 2010, was added to address the increasing wolf depredations affecting the Montana livestock community, and to improve depredation responses and efficiency.

1.6.8 MOUs Between Tribes and WS

WS has MOUS with BN, CSKT, Crow, Fort Peck and Fort Belknap Tribes. The most recent MOUs with BN and CSKT were signed in 1993 and 2011 respectively. The MOUs outline the roles and responsibilities of the Tribes and WS in dealing with a variety of wildlife damage problems on their reservations, including wolf damage problems. GWDM on Tribal lands is directed by the MOUs between WS and the individual Tribes. Any actions conducted under either the Proposed Action or Alternative two would be consistent with the guidance in this MOU. Additional protocol, effective March 2010, was added to address the increasing wolf depredations affecting the Montana livestock community, and to improve depredation responses and efficiency.

1.6.9 Annual Monitoring Reports for WS Predator Damage Management EAs

Since completion of the Montana Predator Damage Management EAs, the Montana WS program has prepared annual monitoring reports to review relevant data regarding WS predator damage management, including GWDM. All of these monitoring reports have continued to show that WS predator damage management is having no significant adverse effects on the quality of the human environment.

1.6.10 CE Records for WS GWDM in Montana

In addition to the Predator Damage Management EAs and annual monitoring reports prepared by WS, CE records were prepared in 2009, 2010, 2011 and 2012 for individual GWDM actions conducted in Montana under the GW Plans where wolf predation on livestock had occurred. These documents analyzed the potential impacts of wolf removals expected to occur in response to depredations on livestock under the current program of GWDM. These analyses all indicated that expected GWDM actions would not cause significant impacts on Montana's wolf population, or on any nontarget species.

1.6.11 USFS Land and Resource Management Plans (LRMPs)

USFS has LRMPs, or "Forest Plans," for their National Forests. WS, under a national MOU, has authority to conduct wolf management for the protection of private resources on their lands and is responsible for NEPA compliance. WS, USFS, and MFWP have annual work plan meetings to discuss management actions that are anticipated on each USFS National Forest. During these meetings, USFS identifies anticipated activities that are inconsistent with their LRMP. If an Alternative in this NEPA process were selected that was inconsistent with the LRMP, USFS could amend the LRMP to be consistent with the EA, or elements of that Alternative could be modified when operating on that Forest. The decision would not be implemented on USFS lands until the inconsistency was resolved either through amendment of the LRMP or modification of the Alternative. Any inconsistencies would be identified and resolved before a GWDM project was

conducted on a National Forest, unless an action were regarded as *emergency management* to resolve an immediate need such as taking a wolf that had attacked a person.

1.6.12 BLM Resource Management Plans (RMPs)

The BLM uses RMPs to guide land use decisions and management actions on lands they administer. WS, under a national MOU, has authority to conduct wolf management for the protection of private resources on their lands and is responsible for NEPA compliance. WS and BLM have annual work plan meetings to discuss management actions that are anticipated on each BLM District. During these meetings, BLM identifies anticipated activities that are inconsistent with their RMP. If an Alternative in this NEPA process were selected that was inconsistent with the RMP, BLM could amend the RMP to be consistent with the EA, or elements of that Alternative could be modified when operating on that District. The decision would not be implemented on BLM administered lands until the inconsistency was resolved either through amendment of the RMP or modification of the Alternative. Any inconsistencies would be identified and resolved prior to a GWDM project being conducted, unless an action were regarded as *emergency management* to resolve an immediate need such as taking a wolf that had attacked a person.

1.7 REGULATED SPORT HARVEST[16]

Regulated public harvest of wolves, recommended by the Governor's Wolf Advisory Council in 2000, was included in the 2003 GW Plan. MFWP first began exploring how to design regulated public hunting and trapping for wolves in 2007 and the 2007 Legislature created a wolf hunting license for residents and nonresidents (SB 372). MFWP has developed and implemented wolf harvest strategies that maintain a recovered and connected wolf population, minimize wolf-livestock conflicts, reduce wolf impacts on low or declining ungulate populations and ungulate hunting opportunities, and effectively communicates to all parties[17] the relevance and credibility of the harvest while acknowledging the diversity of values among those parties (MFWP 2010, 2011). In addition, BN could establish hunting seasons on their lands as they deem appropriate per the BN 2008 GW Plan, but none have been established.

Hunting activities will likely reduce conflicts between wolves and livestock, but will not replace the need for agency management activities (Hanauska-Brown et al. 2012). Conflict resolution procedures will follow protocols similar to those that have been in place since 2007 and take into account population objectives and landowner and producer concerns. It is possible during established regulated sport harvest seasons, hunters could remove problem wolves through legal harvest. Season dates and methods of take will be set by the MFWP Commission and Tribes as determined appropriate.

[16] To determine appropriate harvest levels of wolves, MFWP will continue to verify wolf pack activity and estimate wolf populations.

[17] The Montana public has the opportunity for continuous and iterative input into specific decisions about wolf harvest throughout the public season-setting process.

1.7.1 Management Hunts

There may be situations where MFWP or Tribe uses hunters or trappers to respond to livestock depredation complaints, following a process similar to that used in response to game damage. That process would be managed by MFWP or Tribe.

1.8 POPULATION MONITORING

The USFWS developed a post-delisting monitoring plan and delisting rule that requires Montana, Idaho, and Wyoming to maintain ≥30 breeding pairs and ≥300 wolves well distributed among the three states, including ≥10 breeding pairs and ≥100 wolves in each state. During the first 5-years following delisting, federal law required intensive monitoring to ensure the wolf population in Montana is maintained above ≥15 breeding pairs (the 2003 GW Plan). If any of these requirements are not met, the USFWS would initiate a status review to determine if relisting were necessary. Thus, MFWP will continue annual monitoring to quantify the number of packs, breeding pairs, and total number of wolves in Montana. To assist with monitoring, and as required by MCA §87-5-132, MFWP attempts to radio-collar at least one wolf in each pack that is active near livestock or a population center where depredations are chronic or likely. MFWP is also investigating other monitoring techniques such as patch occupancy modeling to enable estimates of the wolf population without such intensive handling and collaring.

Currently, wolf population estimates in Montana are generated by using extensive information derived from radio-collared individuals. Biologists also derive estimates of reproduction, mortality, pack size, pack territories, habits, and other variables. This information, combined with public observation records, is used to verify new pack activity and develop a statewide population estimate (MFWP 2007, 2008, 2009, Hanauska-Brown et al. 2012).

1.9 DECISION TO BE MADE

Based on agency relationships, MOUs and legislative direction, WS is the lead agency for this EA, and therefore responsible for the scope, content and decisions made. The MFWP, USFWS, MDOL, USFS, BLM, CSKT, and BN all had opportunity for input during preparation of the EA to ensure an interdisciplinary approach in compliance with NEPA and agency mandates, policies and regulations.

Based on the scope of this EA, the decisions to be made are:

- Should Montana WS, in cooperation with MFWP, Tribes, and USFWS, continue their involvement in GWDM as currently practiced?
- What mitigation measures should be implemented or continued by WS, and MFWP or Tribes?
- Would the proposed action have significant impacts on the quality of the human environment which would require preparation of an EIS?

1.10 SCOPE OF THIS ANALYSIS

1.10.1 Actions Analyzed

This EA evaluates WS GWDM activities to protect livestock, human and pet health and safety and ungulates as requested, coordinated with and in cooperation with MFWP and other cooperating agencies and the public. The scope of this EA is limited to evaluating the potential impacts of alternatives for WS involvement in GWDM in Montana. Prompt, professional response to wolf conflicts can help maintain and enhance local tolerance of wolves (Fritts et al. 1992, Fritts and Carbyn 1995, Mech 1995, Bangs et al. 2005, 70 FR 1286-1311, 74 FR 15123-15188). Any direct

action taken by WS to address wolf conflicts would be conducted at the request of affected individuals and MFWP, Indian Tribe, or agency, as appropriate.

One important point is that the 2003 GW Plan was established by state entities and MFWP would be implementing the management direction in this document with or without the involvement of WS. Additionally, Tribes establish their own GW Plans and can carry them out without WS involvement. The content and policies established in these documents are, therefore, outside the scope of this EA.

1.10.2 American Indian Lands and Tribes

Wolves play an important role in some tribal culture and beliefs, but the exact nature of this relationship and role varies among tribes. The cooperating agencies and WS recognize the importance of wolves in tribal culture and will continue to work with individual tribes to try and address their concerns regarding human/wolf conflict reduction actions in Montana. WS would only conduct GWDM activities on tribal lands at the request of the tribe and only after appropriate authorizing documents were signed. WS has cooperated with the CSKT and BN in their wolf monitoring and management efforts since their initial involvement in these activities. WS currently has MOU's with CSKT, BN, Crow, Fort Peck and Fort Belknap Tribes and could conduct GWDM on any tribal lands according to established agreements.

1.10.3 Period of Time This EA Is Valid

If it is determined that an EIS is not needed, this EA will remain valid until WS and other appropriate agencies determine that new needs for action, changed conditions, or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document could be supplemented pursuant to NEPA. Monitoring and review of GWDM activities and any associated take of wildlife will be conducted each year to ensure that the impacts of the program are within parameters analyzed in the EA.

1.10.4 Site Specificity

This EA analyzes the potential impacts of GWDM on all public, tribal, and private lands in Montana where wolf conflicts might potentially occur. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever wolf damage, or potential wolf damage occurs and management actions are taken. WS personnel use the WS Decision Model (Slate et al. 1992) as the *"on the ground"* site-specific procedure for each damage management action conducted by WS (see sections 3.3 and 3.4 for a more detailed analysis of the decision making process). The Decision Model is a thought process that guides WS though the analysis and development of the most appropriate individual strategy to reduce damages and detrimental environmental effects from damage management actions. The Decision Model (Slate et al. 1992) and WS Directive 2.105 describe the site-specific thought process that is used by WS.

Planning for the reduction of human/wolf conflicts is conceptually similar to federal or other agency actions whose missions are to stop or prevent adverse consequences from anticipated future events for which the actual sites and locations where they will occur are unknown but could be anywhere in a defined geographic area. Examples of such agencies and programs include fire and police departments, emergency clean-up organizations, and insurance companies. Although some of the sites where wolf damage will occur can be predicted, all specific locations or times where such damage will occur in any given year cannot be predicted. This EA emphasizes major issues as they relate to specific areas whenever possible; however, many issues apply wherever wolf conflicts and resulting management occurs, and are treated as such. The standard WS Decision Model (Slate et al.

1992) would be the site-specific procedure for individual actions conducted by WS. The analyses in this EA are intended to apply to any action that may occur *in any locale* and at *any time* within Montana and as coordinated with MFWP. In this way, WS believes the EA meets the intent of NEPA with regard to site-specific analysis and still be able to meet needs for assistance with GWDM in a timely fashion.

This EA addresses the impacts of GWDM in areas where management activities have already occurred, and in areas where additional agreements may be signed in the future. Because the proposed action is to reduce damage and the program's goals and directives are to provide services when requested, within the constraints of available funding and workforce, it is conceivable that additional GWDM efforts could occur anywhere in Montana. The EA anticipates this potential expansion and analyzes the impacts of such efforts as part of the program.

1.10.5 Summary of Public Involvement

Issues related to the proposed action were initially developed by WS, based on an awareness of issues that have previously been raised regarding predator damage management in general, and GWDM in particular. As part of WS' environmental analysis process, and as required by CEQ (1981) and APHIS-NEPA implementing regulations, this document and its Decision will be made available to the public through "Notices of Availability" published in local media, on websites @ http:/www.aphis.usda.gov/and regulations.gov and through direct mailings of Notices of Availability to parties that have specifically requested to be notified. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA should be revisited and, if appropriate, revised prior to issuance of a final decision. Public notification regarding the availability of the final EA and Decision will be identical to that used for the EA.

1.11 PREVIEW OF THE REMAINDER OF THIS EA

The remainder of this EA is composed of four more Chapters and one Appendix. Chapter 2 discusses the issues, issues not analyzed in detail, and the affected environment. Chapter 3 describes each alternative, alternatives not considered in detail and standard operating procedures (SOPs). Chapter 4 analyzes the environmental impacts associated with each alternative considered in detail. Chapter 5 is a list of preparers, consultants, reviewers, and the literature cited. Appendix A is a copy of the investigative report form used by WS personnel to document wolf depredation investigations.

CHAPTER 2: ISSUES

2.1 INTRODUCTION

Chapter 2 contains a discussion of the issues relevant to the analysis, including issues that received detailed environmental impact analysis in Chapter 4 (Environmental Consequences) and issues not considered in detail, with rationale. This chapter discusses important environmental components that could be affected by the different GWDM alternatives analyzed in this EA.

This chapter focuses on the resources that are relevant to the issues and the alternatives designed to address GWDM in Montana. WS and the Multi-Agency Team's (*i.e*., MFWP, USFWS, BLM, USFS, MDOL, CSKT, and BN) identified four issues to analyze in detail.

The primary issues, questions, and concerns focused around 1) wolf management, wolf population, and wolf distribution 2) state and federal administration and funding 3) predator and prey relationships 4) human health and safety 5) livestock depredation 6) wildlife habitat and land management issues. Some questions and concerns can be answered directly while others are rhetorical, beyond the scope of this analysis, or beyond the jurisdiction of WS.

Pertinent portions of the affected environment are also included in this chapter in the discussion of issues addressed in detail. Additional information on the affected environment is incorporated into the discussion of the environmental impacts in Chapter 4 and the description of the current program.

2.2 AFFECTED ENVIRONMENT

Historical distribution shows wolves were not restricted to specific habitats. Wolves ranged from oak (*Quercus* spp.) savannah habitats of Mexico, through prairies in the Great Plains, through the Rocky Mountains, and the forest and tundra regions in the U.S. and Canada. The presence of wolves in an area is dictated by the availability of habitat for its prey species. Montana's geography is an intermingling of valleys and mountainous terrain, and a patchwork of human settlement, variable wild prey densities, and livestock distribution.

Wolves in Montana occur primarily in the western part of the state, but could be found anywhere in Montana (Hanauska-Brown et al. 2012). Wolves are known to disperse an average of about 60 miles with documented travel distances of up to 500 miles. Wolf pack territories are viable and average about 200 mi^2 in Montana with many packs having an even larger territory. The largest known territory in Montana is 480mi^2. The average wolf pack in Montana will spend 27% of their time on private land. An example of a collared wolf that travelled some distance in 2011 was a black 2.5 year old male wolf that was found near Broadus, but had originally been collared near Jackson, Wyoming, a traveling distance of about 300 linear miles (Hanauska-Brown et al. 2012). Movement of wolves and connectivity between states and provinces continues to be well documented (Hanauska-Brown et al. 2012). Montana shares border wolf packs with Idaho, Wyoming, and Canada. A border pack will reside part time in each state or province (MFWP 2011*b*). Wolves are very mobile and are now expanding their range outside of what has been considered optimal habitat and beginning to show up more regularly on private land with livestock grazing. Western Montana wolf populations may be nearing habitat or population carrying capacity, saturated conditions where territoriality and pack density limit room for additional breeding pairs. In this case population growth can only be accommodated through range expansion. Dispersers that survive eventually find a mate and become breeders.

Future wolf population growth in Montana will likely be determined in part by social conflicts between wolves and humans. How fast the population grows and where wolves will be found will differ across the

area and the alternatives analyzed in this EA reflect that spectrum of social tolerances and management approaches (the 2003 GW Plan).

The area of the proposed action includes all private and public lands in Montana where wolf damage is occurring or could occur. The proposed action could be conducted in urban or rural sites when a request is received and a need is present. Goals of the proposed action include the protection of agricultural and natural resources, property, and human and pet health and safety where wolves cause or could cause losses. Cultural, economic, social, legal, and other components of the affected environment are given further consideration in Section 2.3 of this chapter, and in Chapters 3 and 4.

2.3 ISSUES CONSIDERED IN DETAIL IN CHAPTER 4[18]

Issues were identified by WS, MFWP, USFWS, BLM, USFS, MDOL, CSKT, and BN during preparation of this EA. Some were used to prepare the detailed impact analyses of the alternatives in Chapter 4. The issues were also used to identify minimization measures and to develop SOP's for reducing or eliminating the likelihood of adverse environmental effects from implementation of the proposed action. Some issues, however, did not receive detailed analyses because WS' human/wolf conflict management would not have any adverse effect on the legal, social, or economic environment. The following issues were determined to be relevant by WS, MFWP, USFWS, BLM, USFS, MDOL, CSKT, and BN and are analyzed in detail in Chapter 4:

- Effects on the wolf population in Montana
- Effects on nontarget species populations including State and Federally listed T&E species
- Effects on public and pet health and safety
- Humaneness and animal welfare aspects of the methods to be used

2.3.1 Effects on the Wolf Population in Montana

The Montana wolf population has continued to expand in size and distribution since colonizing northwest Montana near Glacier National Park in the early 1980's and the initial reintroductions into YNP and Idaho in 1995, reaching recovery goals at the end of 2002 (USFWS 2003, MFWP 2010). Wolves are widely distributed throughout western Montana and are expanding their range to other areas of the state; 90% of all wolf packs in Montana are found outside the National Park system (MFWP 2011*b*) and can be found on USFS, BLM, or other public lands and private lands. The minimum number of documented wolf packs in 2011 was 130. Of the 130 documented packs, 39 qualified as breeding pairs (*i.e.*, 2 adults producing ≥2 pups that survive until 31 December of that year) producing 140 pups[19]. In northwest Montana, at least 372 wolves in 85 packs were documented, 23 of which were breeding pairs. In western Montana, at least 147 wolves in 23 packs were documented, 7 of which were breeding pairs. In southwest Montana, at least 134 wolves in 22 packs were found, 9 of which were breeding pairs. The population increased 15% from the previous year's minimum population estimate of 566 to 653 (Hanauska-Brown et al. 2012).

MFWP documented a total of 216 mortalities in 2011 statewide due to all causes. The majority of wolf mortality overall in Montana is related to humans: livestock conflict removals, regulated public harvest, car strikes, train strikes, illegal killings, and incidental take related to other activities (*e.g.* trapping and snaring). That pattern is similar across time and all of the NRM, except inside national

[18] Issues with the content and policies in MGWCMP can only be addressed through the MFWP decision-making and public involvement processes and not this EA.

[19] Wolf pup counts are conservative estimates because not all pups in monitored packs were observed, and some documented packs were not visited.

parks where the majority of wolf mortality is due to intraspecific strife (wolf on wolf aggression) or other natural causes.

Documented total wolf mortality in 2011 was higher than in 2010. Mortalities in 2011 included 121 public harvests but many fewer lethal damage management removals (141 in 2010, 64 in 2011). Of the 64 wolves removed in 2011 for livestock depredations, 7 were killed by private citizens under the federal 10j regulations or a Montana state law known as the Defense of Property statute. Other mortalities included; 8 illegal kills, 7 vehicle collisions, 1 train collision, 1 electrocution (downed power line), and 1 legal take. In addition, 7 wolves died of natural causes[20] and 5 wolves died of unknown causes (Hanauska-Brown et al. 2012).

Wolves found in Montana are currently managed by MFWP and are classified as a Species in Need of Management statewide (ARM §12.9.1301). In 2003 the Montana Fish and Game Commission adopted the GW Plan which ensures maintenance of a recovered population and increased Montana's minimum wolf population as directed in the Federal Plan from 100 individuals and 10 breeding pairs to 150 individuals and 15 breeding pairs. The purpose of the 2003 GW Plan is to insure a viable gray wolf population, provide for public harvest, reduce conflict, and provide a flexible, adaptive process for the management of wolf populations following de-listing. Concerns that GWDM activities might result in the reduction of local populations of wolves or have a cumulative adverse effect on the viability of the Montana wolf population will be addressed in detail in Chapter 4.

Some people may be concerned that GWDM activities would result in the reduction of local populations of wolves or have a cumulative adverse effect on the viability of the Montana wolf population. As analyzed, MFWP and Tribes would continue to request WS to remove wolves that are causing or may potentially cause damage and this take would constitute a small percent of the wolves found in Montana (*i.e.,* 64 wolves in 2011 from an estimated population of 653 (Hanauska-Brown et al. 2012). Dispersal and reproduction aids in the recolonization and maintenance of the Montana wolf population. From 2006 to2011, an annual average of 20.1% of the minimum wolf population was removed through lethal GWDM to protect livestock. Even with the removal of depredating wolves and other cumulative causes of wolf mortality, the Montana wolf population increased from 316 to 653 wolves, an average of 14.7% annual increase (Table 4-3). At the levels of wolf removal for damage management in 2011, WS, MFWP, and the Tribes anticipate that the Montana wolf population will continue to increase, although this rate of increase is anticipated to slow as available habitat is occupied (Hanauska-Brown et al. 2012).

2.3.2 Effects on Nontarget Species Populations Including State and Federally Listed T&E Species

A common concern among members of the public and wildlife professionals, including WS and the cooperating agencies is that the proposed action or any of the alternatives might have adverse impacts on native wildlife species, particularly state or federally-listed T&E species. WS's SOPs include measures intended to reduce the effects of GWDM activities on nontarget species populations and are presented in Chapter 3. For example, WS uses pan-tension devices on foothold traps set for wolves to minimize the potential capture of smaller nontarget species. Of the GWDM methods proposed for use, foot-hold traps and cable restraints pose some risk to nontarget species. Firearms used in ground based shooting and from aerial hunting pose a theoretical risk since it is possible to misidentify similar looking nontargets (e.g., coyotes) from wolves. However, from 2005 through 2011, WS did

[20] Mange continues to be documented in southwest Montana. It does not appear to have a detrimental effect on Montana's wolf population as a whole (Jimenez et al. 2010a).

not take any nontarget species during GWDM activities. Under the preferred alternative, WS' take of nontarget species is not expected to increase to significant levels for any species. Using available harvest data and the annual take by WS, the magnitude of impact for the proposed action is considered extremely low to nonexistent (USDA 1997).

In contrast to adverse impacts on nontarget animals from direct take by GWDM methods, some nontarget species may actually benefit, though this benefit would be unintentional unless it was the focus of the GWDM project. Prime examples are the benefit to species such as elk if wolves removed numbers below population management objectives.

2.3.2.1 Federally Listed T&E Species. Special efforts are made to avoid jeopardizing T&E species through biological evaluations of the potential effects on them and the establishment of special restrictions or mitigation measures to reduce the potential. Currently, the Federal list contains 19 T&E and candidate species in Montana (USFWS 2012*a*) including 4 mammals, 6 birds, 4 fishes, 1 invertebrate, and 4 plants (Table 2-1). WS GWDM will have no effect on the listed birds, fishes, invertebrate, and plants and little potential to adversely affect T&E mammals.

Table 2-1. Federally listed T&E and candidate species in Montana.

ANIMALS			
COMMON NAME	SCIENTIFIC NAME	STATUS	GWDM
Wolverine	*Gulo gulo luscus*	C	-, 0
Black-footed Ferret	*Mustela nigripes*	E/EX	0
Grizzly Bear	*Ursus arctos horribilis*	T	-, 0
Canada Lynx	*Lynx canadensis*	T	-, 0, +
Greater Sage-Grouse	*Centrocercus urophasianus*	C	0
Whooping Crane	*Grus americana*	E	0
Piping Plover	*Charadrius melodus*	T	0
Least Tern	*Sterna antillarum*	E	0
Yellow-bellied Cuckoo (Western pop.)	*Coccyzus americanus*	C	0
Sprague's Pipit	*Anthus spragueii*	C	0
Pallid Sturgeon	*Scaphirhynchus albus*	E	0
White Sturgeon (Kootenai R. pop.)	*Acipenser transmontanus*	E	0
Bull Trout (Columbia and St. Mary/Belly R. pops.)	*Salvelinus confluentus*	T	0
Arctic Grayling (Upper Missouri R. DPS)	*Thymallus arcticus*	C	0
Meltwater Lednian Stonefly	*Lednia tumana*	C	0
PLANTS			
Whitebark Pine	*Pinus albicaulis*	C	0
Water Hawellia	*Hawellia aquatilis*	T	0
Ute Ladies'-Tresses	*Spiranthes diluvualis*	T	0
Spalding's Campion (or "Catchfly")	*Silene spaldingii*	T	0
T = Threatened; E = Endangered; EX = Experimental; C = Candidate Wolf DM –Effects Damage Management - Potential adverse effect 0 – No effect + Potential positive effect			

WS consulted with USFWS and established special restrictions on methods and SOPs to nullify or minimize take of T&E, and sensitive species. Special efforts are made to avoid jeopardizing T&E species though biological evaluations of the potential effects of the alternatives and the establishment of special restrictions or SOPs. The only species that have the potential to be affected are the grizzly bear, Canada lynx, and wolverine. WS will have no effect conducting GWDM on any of the other listed species. WS conducted Section 7 consultations with USFWS for wildlife damage control programs for the Canada lynx and grizzly bear. In 2009 and 2012, WS Montana received Biological Opinions (BOs) for lynx and grizzly bears which supersede

earlier consultations in which the Service stated that "it is the Service's biological opinion that the effects of the statewide Montana Wildlife Services' wildlife damage program in Montana on Canada lynx (USFWS 2009a) and grizzly bear (USFWS 2012c) are not likely to jeopardize the continued existence. . ." of these species following Reasonable and Prudent Measures and terms and conditions of the BOs. In fact the lynx BO states that the conservation measures and SOPs that WS has in place nullifies the need for Reasonable and Prudent Measures because it is the belief of USFWS that WS will not take a lynx, WS abides by these.

Table 2-1 denotes where a problem could occur involving GWDM, but the likelihood of occurrence would be nullified using methods that have low potential for take such as the use of pan-tension devices on traps. WS has determined that the proposed action will have no effect on all other federally listed nontarget species or critical habitat in the NRM, except potentially the wolverine, listed in Table 2-1. Since the wolverine is a candidate species, no consultation is needed, however, conservation measures to avoid taking lynx will provide protection from taking a wolverine since they mostly can be found in the same habitat. WS will adhere to WS conservation measures and SOPs, and reasonable and prudent measures, terms and conditions, and other provisions for the protection of federally listed species in USDA (1997, Appendix F) and BOs for the grizzly bear (USFWS 2012*c*) and Canada lynx (USFWS 2009*a*). USFWS had no concerns with or in Section 7 consultations regarding GWDM proposed in this EA.

The SOPs in Chapter 3 include measures intended to reduce or nullify the effects on nontarget species populations and to avoid jeopardizing T&E species' populations. All activities would be conducted in accordance with the local, State, and Federal laws and guidelines for GWDM.

2.3.2.2 State Listed T&E Species. The Montana Natural Heritage Program (MNHP) (2012) lists animal and plant species of concern with ranks between S1 (extremely limited or rapidly declining population numbers, range, or habitat, and, thus, vulnerable to global extinction or statewide extirpation) and S3 (limited or declining population numbers, range, or habitat, and even though abundant in some areas, potentially at risk. The lists (Species of Concern and Potential Species for Concern) have 36 mammals, 84 birds, 9 reptiles, 6 amphibians, 28 fish, 140 invertebrates, and 318 plants. This list contains the federally listed species which will not be considered further or included in numbers below because these were discussed in Section 2.3.2.1. GWDM will have no effect on State listed reptiles, amphibians, fish, invertebrates, and plants. It also will have no effect on small mammals [bats (9), shrews (6), small rodents (8)], small raptors (6 owls) water birds (waterfowl, loons, grebes, pelicans, wading birds, rails, shorebirds, gulls, terns, – 21), woodpeckers (4), aerialists (nightjars, swifts, hummingbirds – 5), cuckoos (1), and songbirds (passerines -32). Of the species listed, the only potential is to take large rodents (raptors (hawks, eagles, and owls- 13) and upland gamebirds (2), and those that are large. In all, GWDM has minimal potential to take 7 State listed raptors and 2 upland gamebirds (Table 2-2).

The methods that have a slight potential for take of the species in Table 2-2 are the use of leghold traps and snares. Leghold traps will have pan tension devices on them to exclude all but the bison. If bison are in the area of a wolf damage control project, leghold traps will be placed in areas to minimize potential take. Neck snares have a probability of take. However, since heavy gauge snare cable is used (harder to engage snare) to take wolves and are set off the ground usually higher than 6 inches to a foot, many species, especially smaller ones, will not likely activate a snare, thus nullifying the minimum potential. The primary species that could be taken in a snare include bison, and bald and golden eagles. In areas where a potential exists, WS will use sticks or other methods to reduce this unlikely possibility. It should be noted that none of the species have been taken in GWDM over the last 17 years (as far back as the MIS data base goes) and WS does not anticipate taking any.

The USFWS (USDA 1997), concluded that the methods proposed for use may affect but were not likely to adversely affect bald eagles (currently delisted but still protected by the Bald and Golden Eagle Protection Act) and would have no effect on any other Federally-listed species other than wolves.

Table 2-2. State listed species of concern in Montana, not including those already federally listed, with a minimum potential to be taken in GWDM.

ANIMALS			
COMMON NAME	SCIENTIFIC NAME	STATUS	Wolf DM
White-tailed Prairie Dog	*Cynomys leucurus*	S1	-, 0
Black-tailed Prairie Dog	*Cynomys ludovicianus*	S3	-, 0
Hoary Marmot	*Marmota caligata*	S3S4	-, 0
Pygmy Rabbit	*Brachylagus idahoensis*	S3	-, 0
Black-tailed Jackrabbit	*Lepus californicus*	S2	-, 0
Western Spotted Skunk	*Spilogale gracilis*	S1S3	-, 0
Fisher	*Martes pennanti*	S3	-, 0
Swift Fox	*Vulpes velox*	S3	-, 0
Bison	*Bos bison*	S2	-, 0
White-tailed Ptarmigan	*Lagopus leucura*	S3	-, 0
Sharp-tailed Grouse (Continental Divide west)	*Tympanuchus phasianellus*	S1	-, 0
Bald Eagle	*Haliaeetus leucocephalus*	S4*	-, 0
Northern Goshawk	*Accipiter getilis*	S3	-, 0
Ferruginous Hawk	*Buteo regalis*	S3B	-, 0
Golden Eagle	*Aquila chrysaetos*	S3*	-, 0
Peregrine Falcon	*Falco peregrinus*	S3	-, 0
Great Gray Owl	*Strix nebulosa*	S3	-, 0
Short-eared Owl	*Asio flammeus*	S3S4	-, 0
S1- same as endangered, S2 – same as threatened, S3 – species of concern, S4 – little concern B = Breeding population Wolf DM –Effects Damage Management * Protected under Bald and Golden Eagle Protection Act - Potential adverse effect 0 – No effect + Potential positive effect			

2.3.3 Effects on Public Safety and Pet Health and Safety

A common concern is that the methods used for GWDM (*i.e.*, trapping, snares, aerial gunning and shooting) may be hazardous to people and pets. Other individuals may be concerned that continued increases in wolf populations might threaten livestock and public and pet health or safety. Procedures for addressing risks to human health and safety from wolves are outlined in the GW Plans.

Firearm use is a very sensitive issue because of concerns relating to public safety and firearms misuse. To ensure uniform safe use and awareness of firearms issues, WS employees who use firearms to conduct official duties are required to complete the National Rifle Association (NRA) certified training course and pass the NRA's curriculum for basic pistol, rifle and shotgun certification. New WS employees will not use firearms in any official capacity until they have completed an NRA Firearms Safety Training course. (WS Directive 2.615). WS personnel, who use firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* (18 USC 922) which prohibits firearm possession by anyone who has been convicted of the misdemeanor crime of domestic violence.

One peripheral factor pertinent to assessing the risk of adverse effects of WS BDM activities is the potential for adverse effects from not having professional assistance from programs like WS available

to private entities that express needs for such services. WS operates to assist individuals with damage from wolves where a documented need exists. In the absence of a federal GWDM program, or where restrictions prohibit the delivery of an effective program, it is most likely that GWDM would be conducted by other entities such as MFWP, which would provide professional services to the extent possible, but also much more by private individuals. Private GWDM activities are less likely to be as selective for target species, and less likely to be accountable. Additionally, private activities may include the use of unwise or illegal methods to control wolves. For example, in 2004 several dogs were poisoned in Wyoming and Idaho where baits laced with Temik®, a carbamate insecticide with the active ingredient aldicarb, instead of the wolves they were believed to be targeting (Stahl 2004). A wolf in northwest Colorado was believed to be killed with the poison compound 1080, sodium fluoroacetate (Denver News 2011). Examples are replete in the news with many different types of wildlife being killed to protect resources where people losing resources to wildlife take matters into their own hands. The Texas Department of Agriculture (2006) has a website and brochure devoted solely to preventing pesticide misuse in controlling agricultural pests. Similarly, the United Kingdom Department for Environment, Food, and Rural Affairs (2012) has a "Campaign against Accidental and Illegal Poisoning." Therefore, WS believes that it is in the best interest of the public, pets, and the environment that a professional GWDM program be available because private resource owners could elect to conduct their own control rather than use government services and simply out of frustration resort to inadvisable techniques (Treves and Naughton–Treves 2005).

2.3.4 Humaneness and Animal Welfare Aspects of the Methods to Be Used

The issue of humaneness, as it relates to the killing or capturing of wildlife is an important but complex concept. Kellert and Berry (1980) in a survey of American attitudes toward animals stated that 58% of their respondents, *". . . care more about the suffering of individual animals . . . than they do about species population levels."* Schmidt (1989) indicated that vertebrate pest control for societal benefits could be compatible with animal welfare concerns, if *". . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."*. Suffering has been described as a *" . . . highly unpleasant emotional response usually associated with pain and distress*." However, suffering *" . . . can occur without pain . . .*," and *". . . pain can occur without suffering . . ."* (American Veterinary Medical Association (AVMA) 2001). Because suffering carries with it the implication of a time frame, a case could be made for *" . . . little or no suffering where death comes immediately . . ."* (California Department of Fish and Game 2004), as in the case of shooting or drug-induced euthanasia.

Defining pain as a component of humaneness may be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and the causes that elicit pain responses in humans would *" . . . probably because for pain in other animals..."* (AVMA 1987). However, pain experienced by individual animals probably ranges from none to considerable (California Department of Fish and Game 2004). WS acknowledges that some damage management methods, such as foot-hold traps and cable restraints, may cause varying degrees of pain in different animal species for varying lengths of time. However, at what point pain diminishes or stops under these types of restraint has not been measured by the scientific community. Wildlife managers and the public would both be better served to recognize the complexity of defining suffering, since *" . . . neither medical nor veterinary curricula explicitly address suffering or its relief"* (California Department of Fish and Game 1991, 2004).

Pain and suffering as it relates to tools used to capture animals, is often interpreted differently by professional wildlife biologists and lay people, and people that receive wolf damage or threats of damage may perceive humaneness differently, particularly if their pets or livestock are injured or killed and they contemplate the humaneness of having their pets or livestock killed by wolves. The

issue of humaneness has at least two aspects in relation to the proposed action.

1. Animal welfare organizations are concerned that some methods used to manage wildlife damage expose animals to unnecessary pain and suffering. Research suggests that with some methods, such as restraint in foothold traps, changes in the blood chemistry of trapped animals indicate "stress." Blood measurements indicated similar changes in foxes that had been chased by dogs for about 5 minutes as those restrained in traps (USDA 1997). However, such research has not yet progressed to the development of objective, quantitative measurements of pain or stress for use in evaluating humaneness.

2. Humaneness, as perceived by the livestock industry and pet owners, requires that domestic animals be protected from predators because humans have bred much of the natural defense capabilities out of domestic animals. It has been argued that man has a moral obligation to protect these animals from predators (USDA 1997). Predators frequently do not kill larger prey animals quickly, and will often begin feeding on them while they are alive and still conscious (Wade and Bowns 1982).

Therefore, humaneness, in part, appears to be a person's perception of pain or suffering inflicted on an animal, which, in turn, is governed by the person's past experiences. Different people may perceive the humaneness of an action in different ways. The challenge in coping with this issue remains how to achieve the least amount of suffering within the constraints imposed by current technology, funding, workforce, and social concerns. The decision making process involves tradeoffs between the aforementioned aspects of pain from damage management activities and the needs of humans to reduce wildlife damage. An objective analysis of this issue must consider not only the welfare of wild animals but also the welfare of humans and prey animals if damage and losses are not stopped.

WS and MFWP personnel are trained professionals who strive to use the most humane methods available to them, recognizing the constraints of current technology, workforce, funding and social concerns. In determining the damage management strategy, preference would be given to practical and effective nonlethal methods (WS Directive 2.101). However, nonlethal methods may not always be applied as a first response to each damage problem. The most appropriate response could be a combination of nonlethal and lethal methods, or there could be instances where application of lethal methods alone would be the most appropriate strategy.

WS has improved the selectivity and humaneness of many management devices through research and is striving to bring new, more humane tools and methods into use. WS, through the combined efforts of the WS state programs and the USDA, APHIS, WS, National Wildlife Research Center (NWRC), has been involved in the testing and development of a number of nonlethal GWDM techniques including fladry and turbo fladry, pyrotechnics, livestock guarding animals, remote activated guard devices, and light-siren devices. NWRC has conducted research on tranquilizer devices to reduce stress and injuries to animals captured in traps. However, improved GWDM methods are still needed. Until new methods and tools are developed, a certain amount of animal suffering could occur (*e.g.*, when nonlethal damage management methods are not practical, available, or effective). Whenever possible and practical, WS employs euthanasia methods recommended by the AVMA (2007) and professional wildlife damage managers (Julien et al. 2010), even though the AVMA euthanasia methods were developed principally for companion animals and slaughter of food animals, and not for free-ranging wildlife.

2.4 ISSUES NOT CONSIDERED IN DETAIL AND RATIONALE FOR EXCLUSION

2.4.1 Impacts to Stakeholders Including Aesthetics of Wildlife

Public reaction to GWDM is variable and mixed because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to reduce conflicts between humans and wolves. GWDM is likely favored by property owners who are experiencing damage because management actions would likely be successfully in resolving wolf conflicts, while others may be dismayed if wolves are lethally removed to resolve their damage problems. Individuals not directly affected by the threats or damage may be supportive, neutral, or totally opposed to any removal of wolves from specific locations or sites. Some individuals oppose GWDM because they believe it is morally wrong to kill or use animals for any reason or they believe the benefits from wolves outweigh the associated damage. Individuals totally opposed to lethal GWDM methods want agencies to emphasize tolerance for wolf damage and threats to public and pet health or safety. Ranchers, hunters and elk enthusiasts would be supportive of GWDM because it has the potential to reduce damages to resource that are more important to them. These people may feel their aesthetic experiences are enhanced opportunities to encounter elk if wolves were removed.

Some consider wolves to have high non-consumptive values (*i.e.,* viewing, hearing, photographing) and indirect values (*e.g.*, spiritual, and existence values). The ability to view and aesthetically enjoy wolves at a particular site could be temporarily limited if the wolves are removed. New animals would most likely reoccupy the area in the future if suitable habitat exists, although the length of time until new wolves arrive is variable, depending on the habitat type, time of year, and population density of wolves in nearby areas. Given the relatively high number of wolves and wolf packs in Montana (Hanauska-Brown et al. 2012), and given that GWDM will not jeopardize the viability of the wolf population, other opportunities to view, hear, and aesthetically enjoy wolves will continue to be available to the public (the 2003 GW Plan). The likelihood of getting to see wolves will probably be greatest for people who have knowledge of wolf behavior and habits and make the effort to visit sites with adequate habitat outside of management areas. People interested in seeing or hearing wolves could continue to contact their local MFWP office to inquire about the best opportunities.

2.4.2 GWDM Minimizes Negative Attitudes Toward Wolves and the Likelihood of Illegal Wolf Killings

MFWP and Tribes are aware that illegal killing of wolves occurs in Montana and discuss the preventive measures that MFWP and Tribes will take GW Plans, Hanauska-Brown et al. 2012). MFWP, the Tribes, and WS realize that a small portion of the human population could likely kill wolves no matter what GWDM program is in place. However, the agencies also believe that prompt, professional, effective resolution of conflicts with wolves will help maintain public tolerance of wolves and allow for wolf population persistence, will prevent an increase in untrained individuals attempting GWDM on their own, and should reduce the likelihood of an increase in anti-wolf behaviors by intolerant stakeholders (GW Plans). Treves and Naughton-Treves (2005) stated that lethal control can foster the coexistence between people and wildlife and has a legitimate role in wildlife management, especially undertaken by government entities and with careful consideration. The illegal killing generally occurs when people feel they have no legal access to resolution of their problems or no resolution has been achieved by other means.

Most people would rather take advantage of an effective legal GWDM program than take illegal action and suffer the consequences of legal prosecution. Based on estimates from MFWP, illegal take

of wolves accounted for 6 wolves in Montana in 2011 (Hanauska-Brown et al 2012). The agencies believe that an integrated GWDM program which includes access to lethal methods would be the most effective in resolving conflicts with wolves. Social studies by Kellert (1999), Schanning et al. (2003), Naughton-Treves et al. (2003), and Naughton et al. (2005) in the Great Lakes area show strong public support for lethal management of problem wolves by government agents. Illegal killing by private individuals are less likely to be specific and could potentially have more adverse impacts on the wolf population than focused lethal actions by trained, agency professionals. Illegal killing by untrained individuals is also less likely to be effective in reducing depredation events, as it would be less likely to target the specific depredating animals. Federal and state law enforcement personnel strive to prevent illegal killing of wolves, but the remote nature of much of the areas inhabited by wolves in Montana makes it difficult to protect wolves from illegal actions. Montana conservation officers are the primary investigators for wolf cases in Montana. Under State law, a violation of wolf harvest regulations or illegal take of a wolf would be a violation of MCA §87-1-111 and could result in a misdemeanor fine of $1,000. Multiple violations may be considered flagrant or felonious and result in higher fines and penalties including jail time, loss of hunting privileges, and forfeiture of equipment used in the crime.

The Wildlife Society, an international organization of professional wildlife biologists, states that "control of wolves preying on livestock and pets is imperative and should be prompt and efficient if illegal killing is to be prevented and human tolerance of the presence of wolves is to be maintained" (Peek et al. 1991). The International Union of Nature and Natural Resources or World Conservation Union (IUCN) has established a "Manifesto on Wolf Conservation" (IUCN 1994). The 7th Principle for wolf conservation stated, "It is recognized that occasionally there may be a scientific established need to reduce non-endangered wolf populations; further it may become scientifically established that in certain endangered wolf populations specific individuals must be removed by appropriate conservation authority for the benefit of the wolf population." In an extensive literature review of strategies for reducing carnivore/livestock conflict by Norwegian biologists, it was concluded that lethal control should be considered on endangered carnivores such as wolves to prevent expansion into areas of high conflict (Linnell et al. 1996).

There is some indication that illegal killing was on the rise in the Western Great Lakes wolf population before an integrated GWDM program was authorized in 2003 at which point illegal killing appears to have dropped off. In Wisconsin, there were 15 illegal kills in 2002 just prior to the establishment of the 4(d) rule for wolf management. The rate of illegal killing of collared wolves in 2005 and 2006 suggests that illegal killing may again be on the rise, possibly reflecting frustrations with delays in federal delisting of wolves and the federal court actions. In March 2005, poisoned dog food, probably set-out for wolves, was found in several locations in Ashland and Price Counties, Wisconsin suggesting attempts to reduce wolf numbers shortly after the 4(d) rule was eliminated and lethal control ceased. In 2006, illegal shooting was the greatest source of mortality in radio-collared wolves, with 6 of the 72 radio-collared wolves illegally killed, and overall total of 16 illegal wolf kills (uncollared and collared animals combined). This rate of illegal killing was the highest seen by Wisconsin Department of Natural Resources in recent years and is similar to rates seen in the early 1980s (Wydeven and Wiedenhoeft 2007). Of the 70 known wolf mortalities in 2006 (collared and uncollared wolves), 16 (23%) were caused by illegal shooting, 23 (33%) to vehicle collisions, and 18 (26%) to damage management activities (Wydeven and Wiedenhoeft 2007). A total of 9 wolves were detected shot during the regular 9-day November deer firearm season, the most ever recorded (Wydeven et al. 2007). Concerns that illegal take may increase in the absence of an effective GWDM program are part of the reasoning behind the Wisconsin Department of Natural Resources' (1999) inclusion of lethal methods in their wolf management plan.

2.4.3 Sociological Issues Including the Aesthetic and Sociological Values of Wildlife

2.4.3.1 Variations in Perception of WDM. During the last 200 years, broad-scale changes in land-use patterns *(e.g*., housing developments, agriculture, roads, and industrial complexes) have occurred as the increasing human population settled North America. Notable is the large-scale conversion of natural landscapes to agricultural and urban environments. As humans encroach on wild habitats, they compete with wildlife for space and other resources, which increases the potential for conflicts. Concurrent with this growth and change is a desire by some segments of the public to completely protect all wildlife, which can create localized conflicts with resource managers and owners experiencing problems with some species. USDA (1997) summarizes the American perspective of the relationship between wildlife values and wildlife damage, as follows:

> "*Wildlife has either positive or negative values, depending on varying human perspectives and circumstances . . . Wildlife is generally regarded as providing economic, recreational and aesthetic benefits . . . and the mere knowledge that wildlife exists is a positive benefit to many people. However . . . the activities of some wildlife may result in economic losses to agriculture and damage to property . . . Sensitivity to varying perspectives and value is required to manage the balance between human and wildlife needs. In addressing conflicts, wildlife managers must consider not only the needs of those directly affected by wildlife damage but a range of environmental, sociocultural and economic considerations as well*."

Biological carrying capacity is the limit of the land or habitat to support healthy populations of species without long-term degradation of either the health of the species or the associated environment (Decker and Purdy 1988). The wildlife acceptance capacity (also known as cultural carrying capacity) is the limit of human tolerance for wildlife, or the maximum number of a given species that can coexist compatibly with local human populations (Decker and Purdy 1988). These capacities are especially important in areas inhabited by humans because they define the sensitivity of a local community to a specific wildlife species and their problems. For any given situation involving a wildlife conflict, individuals directly or indirectly affected by the damage will have varying degrees of tolerance for the damage and the species involved in the damage. This tolerance determines the "wildlife acceptance capacity," which is often lower than the "biological carrying capacity." For example, the biological carrying capacity of wolves in Montana could be higher than their current population; however, for some individuals and groups, the area has as many or more wolves than can be tolerated (*i.e.*, for these individuals, the wildlife acceptance capacity has been reached). Once the wildlife acceptance capacity of a species is reached or exceeded, humans demand implementation of programs, both lethal and nonlethal to reduce damage or threats of damage.

In addition, the human attraction to animals has been well documented throughout history, an idea supported by prehistoric cave paintings and the domestication of wild animals. Today's American public is no exception, as evidenced by the large percentage of households that have pets or observe wildlife (USFWS 2006). Some people also may consider individual wild mammals and birds as "pets" and exhibit affection toward these animals. They may also want to have more wild animals in their immediate environment. Some people feel a spiritual bond with wild animals. Conversely, some people have no emotional attachment to wildlife; some may even fear the presence of wild animals in their vicinity and demand their immediate removal. Conflicting wildlife values result in highly variable public opinions about the best ways to manage conflicts between humans and wildlife, making the implementation and conduct of WDM programs extremely complex.

Ideas about how these programs are implemented and conducted are as unique as the almost infinite combinations of philosophies, psyches, aesthetic values, personal attitudes, and opinions found in humans. These differences of opinion result in concerns that the proposed action or the alternatives would result in the loss of aesthetic, cultural, or spiritual benefits to the general public and resource owners.

2.4.3.2 Aesthetic and Sociological Values of Wildlife. Wildlife is generally regarded as a source of economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics is truly subjective, dependent on what an observer regards as beautiful. Wildlife populations also provide a range of direct and indirect social and economic benefits (Decker and Goff 1987). Direct benefits are derived from a user's personal relationship or direct contact with wildlife and may include either consumptive (*e.g.*, using or intending to use the animal such as in hunting or fishing) or non-consumptive use (*e.g.*, observing or photographing animals) (Decker and Goff 1987). Indirect benefits, or indirect exercised values, arise without a human being in direct contact with an animal and are derived from experiences such as looking at pictures or videos of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Two forms of indirect benefits exist according to Decker and Goff (1987): bequest and pure existence. Bequest benefits arise from the belief that wildlife should exist for future generations to enjoy; pure existence benefits accrue from the knowledge that the animals exist in the human environment (Decker and Goff 1987) or that they contribute to the stability of natural ecosystems (Bishop 1987).

Some people directly affected by problems caused by wolves insist on the lethal removal of the problem animal(s) from the area where the conflict occurs. Others have the view that all wildlife involved in conflicts should be captured and relocated to another area to alleviate the problem. Individuals not directly affected by a conflict may be supportive of affected humans, neutral, or totally opposed to any removal of wildlife from specific locations or sites.

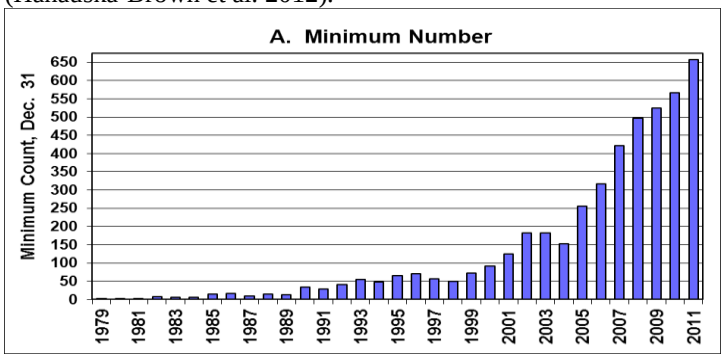
Those who oppose removal of wildlife may do so because of emotional or spiritual ties to the animals, which are similar to the bonds that may exist between a human and a pet. Some may totally oppose GWDM, especially if lethal methods are used, and want WS and MFWP to teach tolerance of wolves causing conflicts. These individuals generally believe that individual animals have inherent value and should not be killed to meet the desires of man-kind. They may also feel that individual animals have rights similar to those of humans and that, if it is inappropriate to treat a human in a given manner, then it is also inappropriate to treat an animal in that manner.

The goal of GWDM is to provide relief from damage or threats of damage while minimizing the potential for negative impacts on the environment including aesthetic and social values. WS would only conduct GWDM at the request of MFWP, citizens, organizations, or others that are experiencing problems (*i.e.*, where a need exists) and as authorized by MFWP. When requests for GWDM assistance are received, WS, MFWP, CSKT, and BN, as appropriate, and the person with the damage problem address issues, concerns, and strategies, and an appropriate plan of action is developed with an explanation of the reasoning for the decision. Management actions would be carried out in a dedicated, humane and professional manner and as outlined in the GW Plans and MFWP-WS MOU.

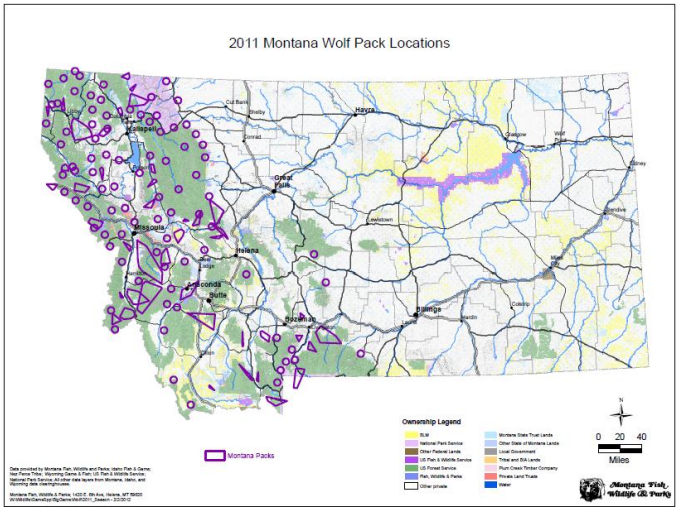
2.4.4 Lethal Removal of Wolves During the Spring and Early Summer Months Could Potentially Result in Wolf Pups Becoming Orphaned

Depending on the circumstances, lethal removal of wolves to address livestock depredation problems may involve removing most or all members of a specific wolf pack. If these types of removals occur during the spring or early summer months, and the decision has been made to remove the entire pack, concerted efforts are made to remove all of the pups as well as the adults, in order to avoid orphaning the pups. It is not always possible to remove all the adult wolves from a pack, and in those cases, the remaining wolf or wolves may continue to feed and care for the remaining pups (Boyd and Jimenez 1994, Packard 2003). Despite concerted efforts to humanely remove any pups left after all adult wolves of a pack have been removed, one or more pups may be left on very rare occasions without any adult wolves to feed or care for them. The only way to avoid this circumstance altogether would be to limit wolf removal efforts during this time frame, so as to always ensure that at least one or more adult wolves were left to care for any pups. In some circumstances, this would be inconsistent with the objective of stopping chronic wolf predation on livestock.

Figure 2-1. Estimated minimum number of wolves in Montana (Hanauska-Brown et al. 2012).



Verified wolf pack distribution in Montana December 31, 2011.



Unfortunately, there could be occasional instances where dependent young may be orphaned during GWDM activities. To keep things in perspective, it is important to consider the amount of suffering and death that occurs in the absence of predator removal as well. Predators by definition kill and eat prey, which does not ordinarily represent a problem unless this behavior conflicts with human interests. But regardless of whether predation creates conflicts with human interests, prey species are typically subjected to pain and suffering when preyed upon by predators. Death in nature is notoriously harsh (Howard 1986), and it would be purely speculative to infer whether the fate of any potentially orphaned wolf pups would be any more or less harsh if their parents had not been killed through wolf management activities. To the extent that wolf management removes animals that would otherwise continue to kill, injure, or orphan prey animals, the overall level of pain and suffering may or may not be reduced.

2.4.5 Wolf Removal Through Control Actions or Hunting Could Disrupt a Pack's Social Structure, Thereby Leading to an Increased Likelihood of Conflicts

Hunting and management actions can disrupt pack social structure, but that does not always result in a known outcome (*i.e.*, increased or decreased conflicts). As indicated in Figure 2-1, the estimated number of wolves and wolf packs in Montana has steadily increased despite management actions that removed specific wolves for depredations and those removed from regulated sport hunting. The data in Figure 2-1 suggests that if the number of wolves in Montana could be reduced, the result would likely be a reduction in wolf predation on livestock, rather than an increase. As described in Hanauska-Brown et al (2012), hunting activities will likely reduce conflicts between wolves and livestock, but will not replace the need for agency management activities taken on specific individual wolves or packs.

From a conflict management perspective, Bradley (2004) found that after partial or complete wolf pack removal, depredations usually ceased for the remainder of the given grazing season. However, most breeding or nonbreeding packs that were only partially removed (68%) depredated again within the year. Further, the rate of recolonization of territories, where entire packs were removed, was high (70%) and most recolonizations (86%) occurred within a year of removal of the previous pack; most packs (86%) that recolonized were implicated in new depredations.

Pack resilience to mortality is inherent in wolf behavioral adaptation and reproductive capabilities (Brainerd et al. 2008). Wolf populations have sustained human-caused mortality rates of 30 to 50% without experiencing declines in abundance (Keith 1983, Fuller et al. 2003). Based on mean pack size of 8, mean litter size of 5, and 38% pups in packs, Boertje and Stephenson (1992) suggested 42% of juveniles and 36% of adults must be removed annually to achieve population stability. Mech (1970) suggests that more than 50% of wolves older than 5-10 months must be killed to "control" the wolf population; other researchers have indicated declines may occur with human-caused mortality at 40% of fall wolf populations (Ballard et al. 1997, Peterson et al. 1984). In addition, Brainerd et al. (2008) found that 62% of packs in recovering populations retained territories despite breeder loss, and of those who lost territories, one-half became re-established. Furthermore, pup survival was primarily dependent on size of pack and age of pup because multiple pack members feed pups despite loss of a breeder. Pup survival in 84% of packs with breeder loss was similar or higher than packs without breeder loss (Mech and Boitani 2003). Brainerd et al. (2008) stated that breeder replacement was highest and fastest in populations greater than 75 wolves, as is currently (and likely always to be) the case in Montana (the 2003 GW Plan).

MacNulty et al. (2009*a*, 2009*b*) discussed evidence from observations of YNP wolves suggesting that as wolves' age, their ability to kill elk declined due to physiological deterioration, similar to the decline in abilities of human athletes as they age. The authors' data suggested that 2-3 year old wolves were in the best physical condition to attack and kill prey, and the higher the proportion of wolves over age 3 in the population, the lower the rate at which they kill elk. Although data are lacking on this subject, it may be possible that if wolves are less able to kill elk or other natural prey as they age, they may be more likely to kill easier prey such as domestic livestock.

MacNulty et al. (2009*b*) further suggested that large body size hinders locomotor performance in ways that may lead to trade-offs in predatory ability and limit the net predatory benefit of larger size. For example, size-related improvements in "handling" prey may come at the expense of pursuing prey. Larger sized wolves have an advantage with a strength-related task, like grappling and subduing prey, but failed to improve performance of capturing prey.

MacNulty et al (2009*b*) suggests that net predatory performance decreases with size when prey is substantially more difficult to pursue than to subdue (*i.e.*, wild ungulates vs. livestock). And if poor locomotor performance narrows the range of potential prey to slower-moving species, this could conceivably put livestock more at risk from an aging or unharvested wolf population. Data obtained from Montana's first wolf hunting season in 2009 indicates all age classes were fairly similarly distributed in the harvest (MFWP 2010).

It is much too soon to draw any definitive conclusions about whether or not Montana's regulated wolf hunting seasons will helped reduce the number of livestock depredation problems. Early indications suggest that the number of wolf depredations on livestock has been less following the hunting seasons than they were prior to the hunting season (MFWP 2010, Hanauska-Brown et al. 2012). However, there are many factors that come into play. It should be noted that the FY 09 confirmed losses included 120 domestic sheep rams that were killed in one night by one wolf pack significantly adding to the FY 09 numbers for confirmed losses. Adding to the uncertainty, WS removed an increasing number of wolves, 151 in FY10 and then a sharp decline were removed in FY11 (67 wolves). WS recognizes that there are many factors affecting wolf depredations on livestock in addition to the legal harvest in 2009 and 2011. At the very least this needs to be monitored over time to evaluate any real trends.

2.4.6 A Reduction in Montana's Wolf Population Through Hunting or Lethal Depredation Management Could Affect Other Aspects of the Environment As Was Demonstrated in YNP

Researchers at YNP agree, at least qualitatively, that wolf restoration, as demonstrated through trophic cascades because of wolf predation or threats of predation, changed prey behavior, interspecies relationships, and habitat use (Schmitz et al. 1997). Wolves have had an indirect effect on plant life because of wolf-caused changes to herbivore density (*e.g.*, elk reduced their use of riparian areas and moved to higher areas because of wolf predation or threats of predation) (Mao et al. 2005, Beyer 2006, Ripple and Beschta 2006). The presence of wolves in YNP positively affects willow growth (Beyer 2006, Ripple and Beschta 2004). Fortin et al. (2005) also found elk less likely to travel into aspen stands when wolves were present; while wolves were present elk travelled more frequently into conifer forests. Creel and Winnie (2005) found elk reduced herd size far from cover on days when wolves were present but were in larger groups the days wolves were absent. Creel and Winnie (2005) showed that in the presence of wolves, elk retreated into forest cover whereas when wolves were absent elk foraged in the open grassland. Gude et al. (2006) found that in the Madison River Valley, elk responded to wolf presence by moving away from wolves, reducing elk effects on vegetation. As a result, taller vegetation benefits a variety of biota, including songbirds (Baker and Hill 2003). Preliminary results show willows (*Salix* spp.) had a greater abundance and diversity of songbirds than suppressed willow stands (Hansen et al. 2005).

Similar results were also observed from elk-willow studies by investigators on the effects of elk herbivory on aspen. One study found taller aspen suckers in aspen stands with high wolf but low elk use (Ripple et al. 2001), but this result did not translate to aspen recruitment (M. Kauffman, unpubl. data *as cited in* Hebblewhite and Smith 2010). Other work found increased cottonwood germination, but similarly low sapling recruitment (Beschta 2003). Importantly, all researchers show that the response was non-uniform suggesting that vegetative responses are linked to variation in wolf predation risk (Ripple and Beschta 2006). Restoration of willow will likely affect other animals and plants as well. Fishes, reptiles, amphibians, and small mammals have all been shown to benefit from wetland restoration (Hebblewhite and Smith 2010).

One example of wolf effects in YNP has been reduction of the coyote population by wolf predation and interspecific competition (Crabtree and Sheldon 1999). Most of the reduction was from direct

killing at wolf kills when coyotes attempted to scavenge on carcasses (Crabtree and Sheldon 1999, Ballard et al. 2003). Recently, however, coyotes have adapted to wolves through changes in use of the landscape and socially by living in smaller groups (J. Sheldon, unpubl. data, *as cited in* Hebblewhite and Smith 2010). The pre-wolf number of coyote packs in Lamar Valley was 11, after wolves were released it declined to 6, but has recently increased to 12 (R. L. Crabtree and J. Sheldon, pers. comm. *as cited in* Hebblewhite and Smith 2010). Further, there is evidence for competition between wolves and mountain lions where wolves are generally dominant over mountain lions[21] (Ruth 2004). While mountain lions and wolves in YNP use prey and habitat differently, reductions in use of space by mountain lions has occurred since wolves were reintroduced (Ruth 2004). Competition between wolves and mountain lions appears to be minimal as mountain lion prey selection and kill rates have not changed compared with pre-wolf monitoring (Murphy 1998, Ruth 2004). However, in another 10 years post-wolf in YNP, based on studies in Banff National Park (Kortello et al. 2007), Hebblewhite and Smith (2010) predict competition between wolves and mountain lions will increase to a degree that could reduce mountain lion abundance, and should prey continue to decline and become less abundant, future competition for prey is likely.

Twelve different scavengers have been recorded using wolf kills in YNP (Wilmers et al. 2003) and five visit virtually every kill: coyotes, ravens, black-billed magpies (*Pica hunsonia*), and golden and bald eagles. Spatially and temporally wolf-killed carrion is more available to scavengers' post–wolf recovery[22]. However, if wolves reduce elk numbers, less total carrion might be available, but evenly distributed carrion might compensate for any negative effect of reduced carrion biomass.

Besides avian scavengers, many mammals also scavenge wolf kills. Black bears are subordinate to wolves at carcasses (Ballard et al. 2003), although lone wolves or young wolves can be at a disadvantage to large black bears. Grizzly bears benefit from wolf-killed prey throughout the year, whereas prior to wolf restoration, carrion was primarily only available in late winter. Carcasses may also be important to bears during fall when other food sources fail or are scarce (like the availability of whitebark pine nuts; grizzly bear use of wolf-killed ungulate carcasses increased during poor whitebark pine nut years). This illustrates an indirect effect between grizzly bears and whitebark pine as influenced by wolves.

Wolf-predated carcasses also benefit invertebrate scavengers and have indirect effects on flora and soil nutrients. Research is just beginning on this topic, but more species of beetles use carcasses than all vertebrates put together. Sikes (1994) found 23,365 beetles of 445 species in two field seasons examining wolf-killed carrion. Obviously, this underestimates the number of decomposers such as insects, mites, invertebrates, bacteria, and fungi, which likely number in the thousands (Hebblewhite and Smith 2010). In addition, even longer-term effects of carcasses are the localized nutrients they deposit. Bump and Peterson (pers. comm., *as cited in* Hebblewhite and Smith 2010) found elevated levels of nutrients around elk carcasses. Using soil samples, one at the carcass site and one away from it, they found 20–500% greater nitrogen (ammonium and nitrate), phosphorous, and potassium in soils around the carcass. They attributed this to direct nutrient leaching from carcasses and indirectly from carnivore and scavenger urine and feces.

Another area of potential indirect effect includes predation on prey exposed to diseases such as brucellosis (*Brucella* spp.). While empirical evidence for this is scarce, Hebblewhite and Smith (2010) believe it is reasonable to expect that density-dependent disease prevalence in ungulates may

[21] Although wolves have clearly been the largest change to the carnivore community in the last 10 years in YNP, both grizzly bear and mountain lion densities have also been higher in the last 10 years.

[22] No other species generates as much carrion over such a consistent temporal scale as wolves (Wilmers et al. 2003).

be reduced by wolf predation (Packer et al. 2003), although in some instances, predation may actually increase disease prevalence (Holt and Roy 2007).

In conclusion, research found that wolves can have direct and indirect effects on the environment (Hebblewhite and Smith 2010). Direct effects include limitation or regulation of elk by wolves, behavioral avoidance of wolves by elk, and competition with other carnivores. Indirect effects include the influence of wolves on willow and aspen growth, species that rely on these plants such as songbirds and beaver, and apparent competition between elk and alternate prey such as bison, moose, and caribou. It is also clear that the most numerous indirect interactions occur between wolves and scavengers. Between 12 and 20 vertebrate scavengers made use of wolf-killed prey, a small number compared to the 445 species of beetle scavengers. However, regardless of the prevalence of indirect effects, the dominant interaction that exists in YNP is between wolves and elk. Elk reduced group sizes and moved into forested cover in the presence of wolves, changed habitat selection to avoid wolves in summer, and avoided aspen stands with higher predation risk (*i.e.*, anti-predatory behavior).

Similar ecological processes between wolves and the environment have likely been occurring and would be expected to continue occurring in Montana under all of the Alternatives being considered in this EA, because MFWP intends to continue managing Montana's wolf population in a sustainable manner (MFWP 2008).

2.4.7 Appropriateness of Preparing an EA and Not an EIS for Such a Large Area or Preparing Multiple EAs for More Site-Specific Areas

Federal agencies have the discretion to determine the geographic scope of their NEPA analyses [*Kleppe v. Sierra Club,* 427 U.S. 390, 414 (1976)] and WS has determined that preparation of this EA to address GWDM at the statewide level in Montana is appropriate. USFWS (2008) prepared a single EA to collectively address specific aspects of GWDM in the three Northern Rockies wolf states (*i.e.*, Montana, Idaho and Wyoming), whereas this EA only covers one state. If in fact a determination is made through this EA that the proposed action would have a significant environmental impact, then an EIS would be prepared. In terms of considering cumulative impacts, one EA covering the entire state of Montana may provide a better analysis than multiple EA's covering smaller zones within the state. A more detailed and more site-specific level of analysis would not substantially improve the decision-making process, and pursuing a more site-specific and more detailed analysis might even be considered inconsistent with NEPA's emphasis on reducing unnecessary paperwork (Eccleston 1995).

2.4.8 Concerns That the Proposed Action May Be Highly Controversial or Its Effects Highly Uncertain Which Would Require an EIS Be Prepared

The failure of any particular special interest group to agree with every act of a Federal agency does not necessarily create a controversy, and NEPA does not require the courts to resolve disagreements among various scientists as to the methodology used by an agency to carry out its mission [Marsh v. Oregon Natural Resource Council, 490 U.S. 360, 378 (1989)]. As was noted in the FONSIs associated with WS's Predator Damage Management EAs (1997*a, b)*: "*The effects on the quality of the human environment are not highly controversial. Although there is some opposition to predator damage management, this action is not highly controversial in terms of size, nature, or effect*." If in fact a determination was made through the EA process that the proposed action would have a significant environmental impact, then an EIS would have been prepared.

2.4.9 Effort Must Be Taken to Target the Individual Wolf(ves) Responsible for the Depredation When Lethal Control Is Implemented

WS personnel are highly trained in the methods of identifying wolf depredations, and use sound scientific information for assessing wolf depredation (Acorn and Dorrance 1990). Agency personnel strive to target the specific wolves involved in depredation to stop the problem as quickly as possible, reduce costs of management, and to reduce impact on wolf populations. However, like any wildlife management action in an uncontrolled situation, no one can guarantee that the wolf taken is always the specific individual involved in the depredation. Identification of depredating individuals is complicated by the pack hunting behavior. In instances when a pack is involved in a depredation incident, multiple individuals may have been involved in the depredation event and agency personnel cannot always determine which individual(s) is responsible. Measures used to identify and target depredating wolves include but are not limited to careful analysis of wolf sign at the site by trained professionals, review of information on radio-collared wolves in the area near the depredation site and confining wolf capture efforts to an area near the depredation site.

The likelihood of capturing individuals or packs involved in the depredation is improved by placing capture equipment near the depredation site and placing equipment based on sign and activity of wolves at the site. Sign from the depredation site can be used to determine if the depredation was caused by an individual wolf or a pack. Generally, traps are set to optimize capture near the kill site(s), and normally wolf packs responsible for making the kills would be the ones most likely visiting such kills. Because wolves are very territorial, strange wolves would not likely enter another packs area or feed on kills made by other packs. Trapping near the depredation site would thus target the pack responsible for making the kill.

2.4.10 Producers Should Not Expect To Prevent All Predation Losses and Some Losses Are a Cost of Doing Business

The agencies do not expect to prevent all losses, nor are they proposing lethal GWDM as a solution to all depredation incidents. WS and MFWP use an integrated approach to resolve wolf damage complaints. In certain situations the use of nonlethal methods maybe more effective for resolving wolf depredation complaints, however there could be situations which require lethal measures. Currently, livestock producers in Montana are only compensated for depredated livestock that WS has determined are confirmed or probable wolf kills. Livestock producers are not compensated in instances when wolves harass livestock, for fence damage after wolves chase livestock through fences, livestock have to be resorted after being dispersed by wolves, and when producers have to pay for feed because livestock are removed from grazing pastures to minimize risks from wolves.

2.4.11 Social and Recreational Concerns

Social and recreational concerns are discussed throughout the EA, in USFWS (1994), 71 FR 43410, 73 FR 10514, 74 FR 15123, the GW Plans, and in USDA (1997) and relevant portions have been incorporated by reference. Social and recreational concerns are also addressed in the analysis of impacts on stakeholders, including aesthetics of wildlife, the possibility of hunting opportunities, and humaneness for each of the alternatives analyzed in detail (Section 4.4).

2.4.12 Irreversible and Irretrievable Commitments of Resources

The following resource values within Montana would not be adversely impacted by any of the Alternatives analyzed in this EA: soils, geology, minerals, water quality/quantity, flood plains,

wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, and range. These will not be analyzed further.

Other than minor uses of fuels for motor vehicles and electrical energy for office maintenance, there are no irreversible or irretrievable commitments of resources. Based on these estimates, the WS GWDM program as directed by the GW Plans produces very negligible impacts on the supply of fossil fuels and electrical energy.

2.4.13 Impacts on Cultural, Archaeological and Historic Resources and Tribal Cultural Properties in Montana

None of the activities analyzed in this EA would cause any significant ground disturbances. Nor would any of the activities have the potential to significantly affect the visual, audible, or atmospheric elements of historic properties and thus are not undertakings as defined by the National Historic Preservation Act (NHPA). WS has determined that GWDM actions are not undertakings as defined by the NHPA because such actions do not have potential to result in changes in the character or use of historic properties. Consultation between Montana WS and the Montana State Historic Preservation Office (SHPO) resulted in no expression of concerns about WS activities as proposed in this EA, and that our activities would not likely result in any effects on historic properties. WS completed consultation with BN, CSKT. These tribes expressed no concerns regarding possible impacts of WS' GWDM activities on properties of Tribal cultural importance in Montana.

2.5 ADDITIONAL ISSUES NOT CONSIDERED BECAUSE THEY ARE OUTSIDE THE SCOPE OF THIS ANALYSIS

2.5.1 The Circumstances Under Which Livestock Owners May Legally Take Wolves

Following the initial issuance of the original (1994) 10j rules for management of the experimental, nonessential gray wolf population in the NRM, subsequent 10j rules (issued in 2005 & 2008) have allowed increasingly greater flexibility and have provided for more aggressive control actions to deal with gray wolf depredations on livestock and other domestic animals. Currently, wolves are managed by the MFWP and Montana State statues (Hanauska-Brown et al. 2012) under the approved GW Plans and outside the scope of this EA.

2.5.2 MFWP, BN, and CSKT Issuance of Permits to Landowners to Take Wolves

Wolves are managed by MFWP under Montana State statues (Hanauska-Brown et al. 2012) and by Tribes as approved by their councils under the USFWS approved GW Plans and the issuance of permits by MFWP and Tribes is their sole responsibility and outside the scope of this EA.

2.5.3 Desire for, or Opposition to, a Hunting Season for Wolves

Wolves are managed by the MFWP and Montana State statues (Hanauska-Brown et al. 2012) under the USFWS approved 2003 GW Plan and the implementation of a regulated hunting season is the sole responsibility of the State of Montana and outside the scope of this EA. Additionally, the BN has approved the potential for sports harvest, but will likely mirror the 2003 GW Plan.

2.5.4 The Appropriateness of Livestock Grazing on Public Lands

Regulating or authorizing livestock grazing on public lands is the responsibility of the public land management agencies. This issue is outside the scope of this EA.

CHAPTER 3: ALTERNATIVES

3.1 INTRODUCTION

This chapter consists of six parts: 1) an introduction, 2) description of alternatives considered and analyzed in detail including the Preferred Action (Alternative 1), 3) a description of general WDM strategies and methodologies, 4) GWDM methods that could be used or recommended by WS, 5) a description of alternatives considered, but eliminated from detailed analysis, and 6) a table of SOPs. Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), *"Methods of Control*" (USDA 1997) and the *"Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program"* (USDA 1997), and information provided by the public. Three alternatives were recognized, developed, and analyzed in detail; and nine alternatives were considered but not analyzed in detail with supporting rationale.

The State of Montana and Tribes have management authority for wolves found within Montana and MFWP and Tribes have established policies and procedures for wolf management within the state (GW Plans). MFWP has stated that they intend to implement their wolf management policies with or without WS involvement as required by Montana statute (MCA §12.9.1301) (L. Hunauska-Brown, MFWP 2011, pers. com.). The purpose of this EA is to examine the environmental impacts of various levels of WS involvement in Montana wolf management. State wolf management policy in Montana conducted by the MFWP, CSKT or BN is not subject to the requirements of NEPA. Thus, in essence, the environmental *status quo* will be the same whether WS is involved or not.

3.2 DESCRIPTION OF THE ALTERNATIVES ANALYZED IN DETAIL

Under the first two alternatives, WS GWDM assistance could be provided on private or public property when: 1) resource owners or managers request assistance to alleviate wolf damage, 2) wolf damage or threats are verified, and 3) agreements or work plans have been completed specifying the details of the damage management action to be conducted. The types of verified wolf conflicts that could be addressed would include: 1) depredation or injury of domestic animals, 2) harassment or threats to domestic animals, 3) property damage, and 4) injury or potential threats to human safety (*e.g*., habituated or bold wolves). All GWDM would be conducted in compliance with appropriate federal, state, and local laws and regulations.

The environmental issues considered for each alternative include impacts on the wolf population; impacts on nontarget species including State and Federally listed T&E species; public and pet health and safety; humaneness and animal welfare aspects of the methods to be used; and sociological issues including the aesthetic and sociological values of wildlife.

3.2.1 Alternative 1 – Continue with Current Adaptive Integrated GWDM in Cooperation with MFWP, Tribes, or USFWS[23] (No Action, Preferred Alternative)

This alternative would continue the GWDM activities that are currently authorized by the MFWP, Tribe, or USFWS, as appropriate. The No Action alternative serves as the baseline against which the impacts of management alternatives can be compared and can be defined as being the continuation of

[23] Ninth Circuit District Judge Judge Molloy ruled that delisting by Congress was constitutional. It is possible that this case may be appealed to the Supreme Court and if this occurs, WS would cooperate with the agency that has management authority for wolves in Montana and this EA would provide the analysis and overarching NEPA compliance for actions conducted under such a scenario.

current management practices (CEQ 1981). WS has been conducting wolf work in Montana, first under the direction of USFWS and currently under MFWP since wolves were introduced in 1995 and even before in Northwestern Montana as wolves came from Canada.

Under this alternative, WS would continue to use or recommend the full range of legal, practical, and effective methods for preventing or reducing wolf damage while minimizing any potentially harmful effects of damage management measures on humans, the overall wolf population, other species, and the environment. WS would provide technical assistance and operational GWDM using nonlethal and lethal management methods selected after applying the WS Decision Model (Slate et al. 1992). In addition, WS would also assist with wolf research, wolf population monitoring, and removal of wolf-dog hybrids. Nonlethal methods used by landowners could include changes in ranch management practices, pet care and supervision, proper carcass disposal, frightening devices, exclusion, guarding animals, habitat modification, and behavior modification of problem wolves. Nonlethal methods used operationally by WS could include, but would not be limited to, foot-hold traps and snares with "stops" (used to live capture wolves for attaching radio collars and collars used to activate frightening devices), frightening devices, aversive conditioning (*e.g.*, with modified dog training collars), and nonlethal projectiles (*e.g.*, rubber bullets and bean bags). Aversive conditioning, nonlethal projectiles, and other experimental damage management techniques would only be used by WS after consultation with the cooperating state and federal agencies, and tribes who have management authority for wolves in Montana.

Lethal methods would be used to reduce damage after practical and appropriate nonlethal methods had been considered and determined to be ineffective or inappropriate in reducing damage to acceptable levels (WS Directive 2.101). In some instances, the most appropriate initial response to a wolf damage problem could involve concurrent use of nonlethal and lethal methods, or the application of lethal methods alone may be the most appropriate strategy in some instances (*e.g.*, aggressive wolves may need to be removed where they are a threat to human safety or wolves may need to be taken in situations where the landowner has already implemented practical and effective nonlethal methods prior to contacting WS, but is still experiencing damage problems). Lethal methods could include shooting, calling and shooting, snares, aerial gunning, and euthanasia of wolves live-captured in foot-hold traps, snares, or other live-capture methods.

MFWP would still maintain authority to implement adaptive Integrated GWDM practices in addition to WS actions, or restrict WS actions consistent with the 2003 GW Plan and the most current MOU between MFWP and WS. For example, MFWP may issue permits to landowners to trap or shoot wolves (or their designated agents) who have domestic animals at risk of wolf depredation and not authorize WS to do any damage control (i.e. trap or shoot). The decision making process for the issuance of depredation permits would occur without WS involvement. How wolves are managed in Montana at the sole discretion of MFWP, Tribe, or USFWS. GWDM could be conducted on private or public lands in Montana when the resource owners, the property owners or land managers, request assistance to alleviate wolf damage, the wolf damage is verified by WS, and *Agreements for Control, Work Initiation Documents, Annual Work Plan*, or other comparable document has been executed. WS would be able to conduct GWDM, including lethal methods, on public land to reduce depredation. Signs would be posted at public access points to areas where foot-hold traps or cable restraints are to be used. Wolf trapping and radio-collaring for wolf population monitoring is conducted on private and public land. In some instances, WS may be requested to address predation by wolves on domestic animals other than livestock such as domestic dogs, whether they are pets, guard dogs, or dogs used for other purposes.

3.2.2 Alternative 2 - Nonlethal GWDM Only

This alternative would work in much the same manner as the preferred alternative except WS would only use and provide advice on nonlethal methods for GWDM. MFWP, Tribes, and property owners would still be able to use lethal methods in accordance with USFWS regulations, state laws and the GW Plans guidelines). The sole decision for the management strategy would be that of MFWP, Tribe, or USFWS.

Nonlethal methods used and recommended by WS would include but are not limited to animal husbandry practices, fencing, electronic guards, fladry, aversive conditioning, nonlethal projectiles, and use of livestock guarding animals. WS could still investigate complaints to determine if complainants meet criteria for wolf damage compensation and could assist MFWP with radio-collaring wolves for monitoring the Montana wolf population. As stated above, MFWP intends to implement all facets of its wolf management policy and MFWP or a designated agent, would still have the authority to conduct lethal GWDM similar to Alternative 1. Thus, the environmental *status quo* would likely be the same under this Alternative as under Alternative 1.

3.2.3 Alternative 3 - No WS GWDM in Montana

Under this alternative, WS would not be involved in GWDM in Montana, but the USFWS, MFWP, or Tribe and property owners would still be able to use lethal and nonlethal methods in accordance with federal and state laws, and the GW Plans guidelines.

If this alternative is selected, WS would not provide any assistance with wolf damage and conflict management in Montana. All requests for GWDM would be referred to MFWP, Tribe, or USFWS, as appropriate. MFWP has stated that they intend to implement the 2003 GW Plan per Montana statute and Rule (ARM §12.9.1301). Thus, the environmental *status quo* would be similar to that as discussed under Alternative 1

3.3 GWDM STRATEGIES AND METHODS

WDM is defined as the alleviation of damage or other problems caused by, or related to, the presence of wildlife (USDA 1997) and an integral part of wildlife management (The Wildlife Society 1992, 2010). Several wolf damage management strategies could be used and are provided below.

3.3.1 Integrated Wildlife Damage Management (IWDM)

During the almost 100 years of resolving human/wildlife conflicts, WS has considered, developed, and used numerous methods for reducing wildlife damage problems (USDA 1997). WS' efforts have involved research and developing new methods, improving existing methods, and implementing effective strategies to resolve and prevent wildlife damage. Usually, the most effective approach to resolve wildlife damage is to integrate the use of several methods simultaneously or sequentially. Adaptive IWDM is the implementation and application of safe and practical methods for the prevention and reduction of damage caused by wildlife based on local problem analyses and the informed judgment of trained personnel. The WS Program applies IWDM to reduce damage by applying the Decision Model discussed in Section 3.3.3 to develop site-specific, adaptive management strategies (Slate et al. 1992). The philosophy behind IWDM is to implement effective management techniques in the most cost-effective[24] manner possible while minimizing the potentially

[24] The cost of management may be a secondary concern because of overriding environmental, social, biological, health or legal considerations.

harmful effects to humans, target and nontarget species, and the environment.

IWDM draws from the largest possible array of options to create a combination of techniques for the specific situations. IWDM may incorporate cultural practices, habitat modification, animal behavior modification, removal of individual animals, local population reduction, or any combination of these, depending on the characteristics of the specific damage problems. The WS program also works closely with the researchers within NWRC, the research arm of the WS program. The NWRC Research Station at Utah State University is the leading predator research complex in the world and the scientists are dedicated to developing new methods to reduce predation. Research at this facility has been critical to the testing and development of nonlethal methods for GWDM, and has improved the selectivity, humaneness and efficacy of capture devices. State WS programs, including Montana WS, assist NWRC with research projects and, as a result of the close collaboration between NWRC and the state programs, the latest research findings can be rapidly incorporated into state operational programs.

3.3.2 IWDM Strategies

3.3.2.1 Technical Assistance Recommendations. Technical assistance is given to people that request assistance from WS where implementation is the responsibility of the requester and can be accomplished safely by them. Technical assistance includes demonstrations on the proper use of some management devices (*e.g.*, propane exploders, electronic guards, fladry, etc.) and information on animal husbandry, wildlife habits, habitat management and animal behavior modification. Technical assistance is generally provided following an on-site visit or verbal consultation with the requester. Typically, several management strategies are described to the requester for short and long-term solutions to damage problems; these strategies are based on the level of risk, need, and practical application. Technical assistance may require substantial effort by agency personnel in the decision making process, but the actual implementation is the responsibility of the requester. Technical assistance also includes site visits and verification of the cause of damage as may be necessary for compensation and financial assistance programs.

Education is an important element of program activities because WDM is about finding "balance" or coexistence between the needs of people and needs of wildlife. This is extremely challenging as nature is not in static balance, but rather, is in continual flux. In addition to the routine dissemination of recommendations and information to individuals or organizations sustaining damage, lectures and demonstrations are provided to ranchers, homeowners, and other interested groups. WS frequently cooperates with other agencies in education and public information efforts. Education and public outreach activities are available from the MFWP @http://fwp.mt.gov/wildthings/management/wolf/default.html, IDFG @http://fishandgame.idaho.gov/cms/wildlife/wolves/, and Wyoming Department of Game and Fish @http://gf.state.wy.us/services/education/wolves/. Outreach materials include periodic new releases, and presentations to livestock producers and hunters by these state agencies and WS. Additionally, technical papers are presented at professional meetings and conferences so that WS personnel, other wildlife professionals, and the public are updated on recent developments in damage management technology, laws and regulations, and agency policies.

3.3.2.2 Operational Damage Management. Situations in which the WS specialist conducts the GWDM activity are referred to as operational damage management. WS specialists provide operational assistance when the problem cannot be resolved through technical assistance. The initial investigation defines the nature and history of the problem, extent of damage, and verifies whether or not the problem is caused by wolves. Professional assistance is often required to resolve problems effectively, especially if the problem is complex, or the management technique

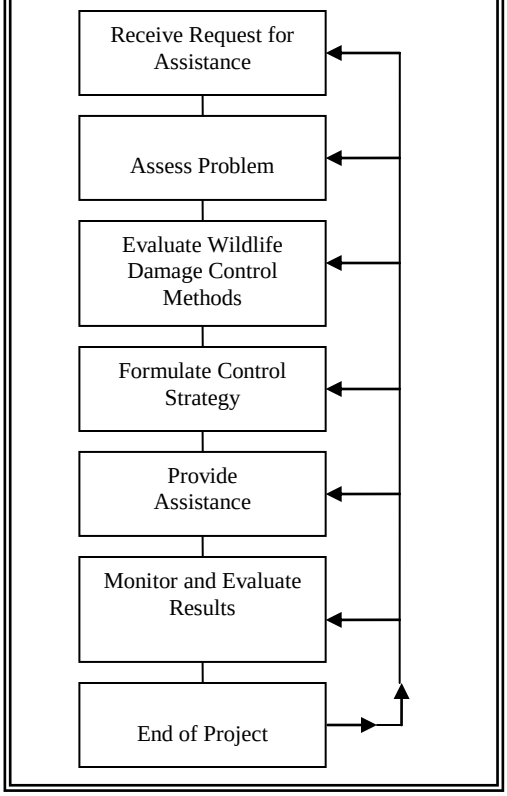
requires the direct supervision by or involvement of an experienced GWDM professional. Wolf biology and behavior and other factors are considered (WS Decision Model) when developing site specific damage management strategies (Slate et al 1992).

3.3.3 WS Decision Model Used for Decision Making

WS personnel use a thought process for evaluating and responding to damage complaints as depicted by the WS Decision Model (Slate et al. 1992) (Figure 3-1). The Decision Model is not a written process, but a mental problem-solving process similar to that used by all wildlife management professionals when addressing human/wildlife conflicts. WS Personnel are trained to assess the problem, and evaluate the appropriateness and availability (legal and administrative) of damage management strategies and methods based on biological, economic and social considerations including:

- Species responsible for the damage (did wolves cause the problem or was it some other species?)
- Magnitude, geographic extent, frequency, historical damage and duration of the problem including review of animal husbandry practices and producer efforts at nonlethal GWDM.
- Status of target and nontarget species, including T&E species, in a given area
- Local environmental conditions
- Potential biological, physical, economic, and social impacts
- Potential legal restrictions
- Costs of damage management[25]

Figure 3-1. APHIS-WS Decision Model.



Following this evaluation, methods deemed to be practical for the situation are incorporated into a management strategy. After this strategy has been implemented, monitoring is conducted and evaluation continues to assess the effectiveness of the strategy. If the strategy is effective, the need for further management is ended. When damage continues intermittently over time, WS, MFWP, or Tribe personnel and the requester, monitor and reevaluate the situation. If one method or a combination of methods fails to stop damage, a different strategy is implemented. In terms of the WS Decision Model (Slate et al. 1992), most damage management efforts consist of a continuous feedback loop between receiving the request and monitoring the results, with the damage management strategy reevaluated and revised periodically, if necessary.

[25] The cost of management may sometimes be secondary because of overriding environmental, legal, public health and safety, animal welfare, or other concerns.

3.3.4 Local Decision Making

The GWDM program in the NRM follows the "co-managerial approach" to solve human/wolf conflicts as generally described by Decker and Chase (1997). Within this management model, trained personnel provide technical assistance regarding the biology and ecology of wolves and the effective, practical, and reasonable methods available, including nonlethal and lethal methods, to the local decision maker(s) to reduce wildlife damage. These decision makers may include community leaders, private property owners, and public property managers. Technical assistance on alleviating damage caused by wolves is also available from other state, federal, Tribe, and private organizations. WS, MFWP, other state and federal agencies, and Tribes may facilitate discussions at local community meetings and make recommendations where funding is available for such. Resource owners and others directly affected by wolf damage or conflicts have direct input into the strategies to resolve the problem(s). They may implement management recommendations provided by WS or others, or may request management assistance from WS, other wildlife management agencies or private businesses or organizations. Local decision makers compare the benefits versus the damage when deciding which methods would be implemented. Local decision makers must weigh the cost of implementing each method or strategy.

3.4 GWDM METHODS

Methods employed for GWDM are discussed here and in USDA (1997). All legal and available methods are considered in GWDM since any could be used to resolve wolf damage to agricultural and natural resources, property, including pets, and human health and safety. A depredation management plan would be discussed upon initial investigation of depredation by wolves. The discussion includes recommendations for suitable nonlethal methods and other practices which may reduce depredation on the property. In Montana, a compensation program is available to livestock owners to help cover part of the financial loss involved when wolves kill or injure livestock. This program is managed by the MLLB. (see section 1.4.1)

3.4.1 Nonlethal Methods Available to Agency Personnel and the Public

Some GWDM methods are available for anyone to use. These consist of nonlethal preventive methods such as cultural[26] practices and localized habitat modification on private property. Cultural practices and other management techniques are implemented by the property owners/managers. Livestock producers and property owners/managers may be encouraged to use these methods, based on the level of risk, need, and professional judgment on their effectiveness and practicality. WS's, MFWP's, and a Tribe's involvement with these methods is usually limited to providing technical assistance because these are mostly applicable to the resource owner to implement. As noted above, the MLLB compensation program currently pays for the cost of animals killed by wolves. It has been proposed that, in the future, this fund may pay for veterinary bills for animals injured by wolves and also nonlethal preventative efforts. However, compensation, in all cases, is limited to the funds in the account. If and when compensation exceeds available funds, which has happened, claims are held without making payments until additional funds are available. At that time, payments are paid out in the order the claims were received.

[26] Cultural practices methods include a variety of practices that can be employed by agricultural producers to reduce resource exposure to wildlife depredation and loss. Cultural practices include, but are not limited to, animal husbandry or crop selection, other habitat modification, and alteration of human behavior. Implementation of these practices is appropriate when the potential for depredation can be reduced without significantly increasing the cost of production or diminishing the resource owner's ability to achieve land management and production goals.

Livestock Management Practices are implemented to prevent or reduce wolf damage and may include: 1) maintaining healthy, well-fed animals, 2) pregnancy testing of cattle, 3) properly disposing of livestock carcasses (*i.e*., rendering, burying, liming, or burning), 4) conducting calving or lambing operations in close proximity to the ranch headquarters, when practical, 5) penning vulnerable livestock at night where practical, 6) monitoring livestock on a regular basis to detect any disease, natural mortality, or predation, and 7) incorporating nonlethal methods. Property owners and land managers could implement these management practices or request the assistance of other agencies or private organizations to implement them, or take no action.

Exclusion may be used to prevent or limit access by predators to livestock pastures, calving or lambing areas, or livestock confinement areas. Where practical and cost effective, sheep, cattle or other vulnerable livestock may be penned near ranch buildings at night.

Fladry involves installing flags hanging about every 20 inches from thin rope or cable stretched about 30 inches above the ground. Fladry is installed around pastures or other areas where livestock are confined, limiting or discouraging wolf access to these areas.

Livestock guarding animals such as guarding dogs or llamas may be used to protect livestock from predators, and sometimes wolves. Livestock guarding animals may distract, deter, repel, or attack wolves that could depredate livestock. It must be noted that there has been numerous cases where wolves have killed guarding animals including guard dogs and guard llamas. There have been cases where guarding dogs have attracted wolves because of the wolf instinct to protect their home range and, thus, become a target of attacks. Guard llamas have been killed quite commonly by wolves in Montana (Table 1-1).

Guarding and hazing involves guarding an area and then using pyrotechnics or other light/noisemaking devices to frighten wolves away from the site. It can be used as an aversive technique, but requires that the projectiles must be used every time the animal attempts to prey on the protected resource so they don't identify conditions when they can obtain prey without receiving a negative experience (Shivik 2004).

Frightening devices are methods that usually involve lights, sound, or motion designed to deter wolves from a certain area. Strobe and flashing lights, propane exploders, sirens, and various combinations of these devices have all been used in attempts to reduce livestock losses, with wide ranging degrees of effectiveness (Linhart 1984, Andelt 1987). Animal habituation (becoming accustomed) to the stimulus is one of the primary limiting factors for frightening devices. Moving the devices intermittently and randomly as well as alternating the stimuli (*e.g*. a different type of noise or light) may extend the effective period of the system (Shivik and Martin 2001). The period of efficacy may also be extended by using systems which are motion activated or only activated when a wolf wearing a transmitter collar comes into close proximity to the protected site. Frightening devices that do not require placing a transmitter collar or similar device on the wolf are available to anyone without a permit.

Compensation for wolf damage in the form of monetary payments comes from the MLLB. Currently losses are paid at full market value for domestic livestock confirmed killed by WS or determined by WS as probable killed by wolves. By Montana State statutes (MCA §2-15-3112) determination of confirmed or probable wolf kills/injuries is done by WS.

3.4.2 Nonlethal Methods Available Only to Agency Personnel

Some nonlethal methods and research projects (*e.g*., population monitoring) involve capture and handling wolves which may not be implemented by the general public. Methods that require capture and handling of live wolves would only be conducted by personnel from MFWP, WS or other appropriately trained agents designated by MFWP and tribal biologists.

Frightening devices that require placing a transmitter collar on a wolf are available to MFWP and their designated agents. Overall efficacy and the duration that they are effective may be improved by using systems which are motion activated or only activated when a wolf wearing a transmitter collar comes into close proximity to the protected site (*e.g.*, a Radio Activated Guard). Frightening devices that do not require placing a transmitter collar or similar device on the wolf are available to anyone without a permit.

Capture and relocation of problem wildlife is a technique that is sometimes used to alleviate wildlife damage problems. The success of a relocation effort, however, depends on the potential for the problem individuals to be captured efficiently and the existence of an appropriate relocation site (Nielsen 1988). While relocation may be appropriate in some situations when the species population is small, wolves are currently found in much of the suitable habitat in Montana and relocation is not necessary for the maintenance of viable populations (73 FR 10514, February 27, 2008). Wolves relocated into suitable habitat are very likely to encounter other resident wolves with established territories. Wolves are highly territorial and established packs sometimes kill trespassing individuals and packs (Mech 1970). Unless it becomes necessary to restore wolves to a specific area to booster genetic connectivity or to areas where they have been extirpated, neither MFWP nor the Tribes will not relocate wolves as per the GW Plans as a general rule.

Relocated wolves may also disperse long distances from the release site (Fritts et al. 1984, Bradley et al. 2005). As a result, relocated wolves may return to damage sites from which they were removed (Fritts et. al. 1984), or, after dispersal movements, can cause damage problems at the new dispersal site (Bradley et al. 2005). Fritts et al. (1984) analyzed the fate of translocated wolves in Minnesota and concluded that translocation was unsuccessful because all wolves traveled away from the release sites, some traveled through agriculture areas, and 42% of wolves with a known fate were recaptured at depredations sites. In the NRM, 27% of translocated wolves again caused depredations, and only 33% joined or formed new packs (Bradley et al. 2005). In this case, the original damage problem has simply been shifted from one property to another.

Foot-hold traps can be effectively used to live capture wolves. When used as a live-capture device, wolves are either physically restrained or chemically immobilized, and released on-site (*e.g*., after receiving a radio-collar for research and monitoring), relocated (see relocation above) or euthanized. Effective trap placement, pan-tension devices, and the selection and placement of appropriate lures and baits by trained personnel contribute to the foot-hold traps selectivity. WS policy requires that foot-hold traps used for GWDM have offset and laminated jaws or padded jaws to reduce foot injury to captured wolves (WS Directive 2.335). Trap jaws may also be designed with protrusions often called “buttons” which may reduce trap related injury.

Foot snares are devices consisting of a cable loop and a locking device that captures an animal around their foot or lower leg. The cable may be activated around the lower leg with a spring (Aldrich), trap-style (Belisle) device, or other type device. The foot snare can be modified with a stop on the cable. Careful snare placement, pan-tension devices, and the selection and placement of appropriate lures and baits by trained personnel contribute to the selectivity of this device. As with foot-hold traps, when foot snares are used as a live-capture device, wolves are either released on-site

(*e.g.*, after receiving a radio-collar for research and monitoring), relocated (see relocation above), or euthanized.

Dart guns are nonlethal capture devices that fires a dart filled with tranquilizer from a specially designed rifle. Once tranquilized, the animal may be handled safely for research or relocation purposes; however, the animal could also be euthanized if lethal removal is warranted. Use of dart guns would have no effect on nontarget species because positive target species identification is made before animals are shot. Thus, WS's use of dart guns is expected to continue to be virtually 100% selective. Use of dart guns may sometimes be the only management option if other factors preclude the setting of equipment. All WS personnel that would dart wolves or deliver immobilizing drugs attend a 3-day accredited training course on immobilizing wildlife and they are required to receive 20 hours of continuing education every 5-years. Montana WS has obtained its own Drug Enforcement Administration (DEA) license and will conform to all applicable laws, regulations and directives. (WS Directive 2.430)

Neck snares are made of wire or cable, and are set to capture an animal by the neck. They are much lighter and easier to use than leg-hold traps and are not generally affected by inclement weather. Snares may be used as lethal or live-capture devices (Olson and Tischaefer 2004) depending on how and where they are set. Snares set to capture an animal by the neck are usually lethal but stops can be attached to the cable to increase the probability of a live capture. Snares positioned to capture the animal around the body can be a useful live-capture device, but are more often used as a lethal control technique. Snares can incorporate a breakaway feature to release nontarget wildlife and livestock where the target animal is smaller than potential nontargets (Phillips and Gruver 1996). Snares can be effectively used wherever a target animal moves through a restricted travel lane (*e.g.*, under fences, trails through vegetation, or den entrances). When an animal moves forward into the loop formed by the cable, the noose tightens and the animal is held. Snares must be set in locations where the likelihood of capturing nontarget animals is minimized. These devices can be fairly selective due to loop size, height placement, and bait types. Appropriate use of lures and baits may also improve the selectivity and efficacy of these devices.

3.4.3 Nonlethal Methods Which May Require Special Authorization from MFWP

Some animal behavior modification systems involve capturing wolves and fitting wolves with collars used to deliver or trigger repellent stimuli (*i.e.*, aversive conditioning). Other systems involve shooting wolves with nonlethal projectiles like rubber bullets. These nonlethal techniques involve intentionally using painful stimuli to modify wolf behavior, and MFWP has determined that permits or other authorizations are required to use these methods and any other experimental GWDM techniques. Methods that require capture and handling of wolves would be conducted only by personnel from MFWP, WS, or the Tribes. The Tribes have authority to use these methods on tribal lands without permission from MFWP. MFWP may require scientific collection permits for the development and testing of new GWDM techniques.

Aversive Stimuli are agents or factors that cause discomfort, pain or an otherwise negative experience paired with specific behaviors to achieve conditioning against these behaviors. One example would be using a shock collar similar to that used for dog training that is activated when wolves come into close proximity to a protected area such as livestock pens (Schultz et al. 2005).

Nonlethal Projectiles involve guarding an area and then using rubber bullets or other nonlethal projectiles to prevent a predation event. These can be used as an aversive technique, but requires that the projectiles must be used every time the animal attempts to prey on the protected resource so they do not identify conditions when they can obtain prey without receiving a negative experience (Shivik

2004). Methods which require around-the-clock presence of a person to guard the resource are most efficiently used when the landowner or resource manager assists with the implementation. MFWP may agree to allow the use of these methods and allow WS to train and authorize private individuals to use them.

3.4.4 Lethal Methods[27]

These methods are specifically designed to lethally remove wolves in certain situations to stabilize, reduce, or eliminate damage. The amount of removal necessary to achieve a reduction in wolf damage varies according to the effectiveness of other damage management strategies, the damage situation, and the level and likelihood of continued depredations. Under Alternatives 1 and 2, WS would use applicable federal regulations, the GW Plans and the most current MOUs between MFWP BN, CSKT or other Tribes, and WS to determine when lethal management would be used. Under any of the Alternatives, private individuals may shoot a wolf in the act of attacking a domestic animal per the GW Plans and as described in MCA §87-3-130. Private individuals may also be issued permits to shoot or trap wolves as determined by MFWP, Tribes or USFWS. The lethal GWDM techniques that would be available to WS under alternatives 1 and 2 include:

Shooting involves the use of firearms to selectively remove target species. Firearms may or may not be used with calling, night-vision equipment, or other methods that allow an animal to be shot at closer range. Firearms are also used to euthanize live-captured wolves.

Snares are devices consisting of a cable loop and a locking device that are placed in travel ways and can be used as a nonlethal or lethal device depending on how they are set and modified. Snares set to capture an animal around the neck and not equipped with "stops" can be used as a lethal device (see also Section 3.4.2).

Aerial Gunning, the shooting of an animal from fixed-winged aircraft or helicopters, is used on all lands where authorized and determined appropriate. Aerial gunning consists of visually sighting target animals and shooting them from the aircraft. Aerial gunning is a method used to protect livestock and wildlife because of the technique's cost effectiveness and efficacy (Smith et al. 1986).

Denning, the manual removal of wolf pups from a den. This would be done if MFWP requests WS to remove an entire pack when pups are still in the den so the pups can be humanely euthanized using a method approved by the AVMA (2007), or donated to a zoo or other institution

Sodium Pentobarbital (Beuthanasia-D) is registered for euthanasia of dogs, but legally may be used on other animals if the animal is not intended for human consumption. Barbiturates depress the central nervous system in descending order, beginning with the cerebral cortex, with unconsciousness progressing to death. The primary advantage of barbiturates is the speed of action on the animal. Barbiturates induce euthanasia smoothly, with minimal discomfort to the animal (AVMA 2007) after an animal has been anesthetized. Beuthanasia-D is a Class III drug whereas pure sodium pentobarbital is a Class II drug because it has added compounds to denature the barbiturate effects of the drug, basically reducing the street value.

[27] No toxicants are currently registered by the U.S. Environmental Protection Agency for wolf damage management in Montana.

3.4.5 Effectiveness of Lethal and Nonlethal Control Efforts in Reducing Wolf Predation

The integrated and adaptive approach employed under the current GWDM program in Montana typically involves consideration of both nonlethal and lethal measures to stop or reduce the likelihood of further wolf damage (WS Directive 2.101). WS has made recommendations on the use of nonlethal management methods to protect resources, but the actual implementation of those methods is the responsibility of the resource owner. However, in assessing the effectiveness of various management approaches to addressing wolf predation on livestock, Bangs et al. (2009) concluded that while nonlethal tools may be temporarily helpful, they were generally ineffective, particularly in areas that simply would have too many livestock conflicts for wolf packs to persist (*i.e.*, scaring wolves away from one specific location in an area with livestock could simply result in the wolves killing livestock in adjacent areas where focused nonlethal efforts are not being employed). Bangs et al. (2009) also concluded that lethal management of problem wolves was usually effective in reducing conflict because it: 1) enhanced effectiveness of nonlethal measures, 2) interrupted use of livestock as food by surviving wolves, 3) removed offending individuals, 4) reduced wolf density in conflict areas, 5) eliminated packs where chronic livestock depredations had been occurring, 6) helped to keep wolf packs out of unsuitable habitat, 7) made surviving pack members temporarily avoid or be more wary of people or areas with livestock, 8) reduced the pack's overall need for food, 9) made it more difficult for the fewer remaining pack members to kill larger prey like adult cattle or attack calves protected by cows, 10) increased the detection rate of subsequent depredations because livestock carcasses were consumed more slowly (so additional control could be applied more rapidly), 11) reduced compensation and control costs, and 12) moderated some of the public anger over wolf predation on livestock. Mech (1995) similarly concluded that in most circumstances, lethal removal of wolves was usually the only practical approach to resolving incidents of wolf predation on livestock. Karlsson and Johansson (2010) reviewed data on livestock predation by brown bears, wolves and lynx on farms in Sweden and concluded that the risk of predation greatly increased during the first several weeks after an initial predation incident. They suggested that management efforts, whether lethal or nonlethal, would be most effective if applied during this period of time following an initial depredation event.

Although nonlethal methods are often only temporarily effective, they may sometimes offer protection for a long enough period of time to protect a resource when it may be most vulnerable. An example is the use of the Radio Activated Guard in small calving pastures. Breck et al. (2002) reported that this frightening device, activated by the radio signal from an approaching radio-collared wolf, was effective in keeping a radio-collared wolf pack away from several small calving pastures in central Idaho for 60 days. However, this device is only useful in those cases where at least one and preferably multiple wolves in the pack are radio-collared, and it is only useful for protecting relatively small areas. Fladry has also been used to deter wolves for up to 60 days before the wolves habituated to it and began killing livestock again (Musiani et al. 2003). One consideration in the use of these temporarily effective nonlethal methods, however, is that if wolves will eventually be lethally removed anyway (after habituating to the frightening stimulus), the investment of time and resources in the nonlethal efforts may not be practical.

One of the most effective nonlethal deterrents to wolf predation may be the on-site presence of humans who remain near the livestock and are vigilant in trying to detect the presence of wolves so they can be consistently frightened away (Shivik 2004). These efforts can be more effective if there are radio-collared wolves in the area and the livestock guardian personnel make use of radio-telemetry receivers to detect the nearby presence of wolves. However, the costs to provide 24/7 human presence around livestock would ordinarily be cost-prohibitive for livestock producers.

Bangs and Shivik (2001) reported that while some nonlethal methods may be temporarily effective, many are expensive to implement and none available at the time of their report were widely effective. Many nonlethal methods of preventing livestock losses to wolves have been tried and abandoned in the United States and Europe because of lack of effectiveness. Use of guard dogs alone has been tried against wolves in Minnesota with only limited success (Fritts et al. 1992). Coppinger and Coppinger (1996) showed the dominance of wolves over livestock guarding dogs in direct confrontations, and Coppinger and Coppinger (1996) and Bangs et al. (1998) reported that wolves have killed livestock guarding dogs. Wolves have also been translocated to other areas, but many either returned to where they were caught or became a problem elsewhere (Fritts et al. 1984, 1985). Mech et al. (1996) concluded that where wolf populations are large and secure, translocation has little value in wolf management. Aversive conditioning (Gustavson and Nicolaus 1987, Shivik and Martin 2001, Shivik et al. 2003) has not yet proven effective with wild wolves (Fritts et al. 1992). Electric fencing may hold some promise for protecting livestock from wolves, but fences tested for coyotes have been extremely expensive, required high maintenance, and were better suited for small areas (Dorrance and Bourne 1980, Nass and Theade 1988, Paul and Gipson 1994), rather than range operations.

In looking at the possible role of livestock husbandry practices in reducing wolf predation, Bradley and Pletscher (2005) assessed multiple factors potentially related to wolf depredations on cattle in fenced pastures in Montana and Idaho. They concluded there was no relationship between depredations and carcass disposal methods, calving locations, calving times, breed of cattle, or the distance cattle were grazed from the forest edge. They did find that depredations were more prevalent in pastures where elk were more likely to occur, where the pastures were larger in size, had more cattle, and where cattle were grazed farther from residences than pastures without depredations. Mech et al. (2000) likewise concluded there were essentially no differences in husbandry practices between farms in Minnesota that suffered chronic wolf depredations, as compared to similar operations which experienced no depredations, and that farms with cattle farther from human habitation suffered more losses.

Haight et al. (2002) and Cochrane et al. (2003) reported on a model developed to assess three different strategies for reducing wolf predation on livestock, including: 1) reactive management, where wolf removal occurred soon after depredations occurred, 2) delayed reactive management, where wolf removal occurred in the winter months prior to the grazing season in areas with a history of previous depredations, and 3) population-size management, where wolves were removed annually in the winter months from all areas near farms. The authors' concluded that: 1) each of these approaches reduced predation by about half compared with no action, 2) delayed reactive management and population-size management actually removed fewer wolves than reactive management because wolves were removed in winter before pups were born, and 3) population-size management was least expensive because repeated annual removal kept most territories near farms free of wolves.

3.5 ALTERNATIVES CONSIDERED BUT NOT IN DETAIL WITH RATIONALE

3.5.1 Bounties

Payment of funds for killing wildlife (bounties) suspected of causing economic losses is not considered effective to reduce wolf damage at this time. This alternative will not be considered in detail because:

- The state has not authorized a bounty program for wolves.
- Bounties are generally not as effective in reducing damage because depredating individuals or local populations are not specifically targeted.
- Circumstances surrounding take of animals is largely unregulated.

- No effective process exists to prevent taking of animals from outside the damage management area for compensation purposes.

3.5.2 Eradication and Suppression

An eradication alternative would direct all WS program efforts toward planned, total elimination of wolves. This alternative will not be considered in detail because:

- The attempted eradication of established wolf populations is contrary to state and federal efforts to protect and conserve wildlife.
- Eradication of wolves is not acceptable to most members of the public. It is also not realistic, practical, or allowable under present WS policy to consider large-scale population suppression.

3.5.3 Damage Management Through Birth Control

Under this alternative, wolf populations would be managed through the use of contraceptives. Wolves would be sterilized or contraceptives administered to limit their ability to produce offspring. A wolf contraceptive, chemosterilant or immunocontraceptive, if delivered to a sufficient number of individuals, could temporarily suppress local breeding populations by inhibiting reproduction. Reduction of local populations would then result from natural mortality and reduced recruitment of young wolves. No wolves would be killed directly with this method; however, treated wolves may continue to cause damage, but probably at an overall lower rate, because there would be no pups to feed.

Contraceptive measures for mammals can be grouped into four categories: surgical sterilization, oral contraception, hormone implantation, and immunocontraception (the use of contraceptive vaccines). These techniques would require that wolves receive either single, multiple, or possibly daily treatment to successfully prevent conception. The use of this method would be subject to approval by federal and state agencies. This alternative is limited because: (1) it may take a number of years of implementation before the wolf population would decline, and, damage may continue for a number of years; (2) surgical sterilization would have to be conducted by licensed veterinarians, which would therefore be extremely expensive; (3) it is difficult to effectively live trap or chemically capture the number of wolves that would need to be sterilized in order to effect an eventual decline in the population; (4) no chemical or biological agents for contraception in wolves has been approved for use by state and federal regulatory authorities; (5) sterilization or other forms of fertility control have an unknown impact on wolf social structure (Haber 1996); and (6) the impacts of this method could have devastating effects if a widespread disease began causing additive mortality to the wolf population.

Sterilization may be useful as an experimental technique to reduce depredation in some highly specialized situations in the future. In coyotes, breeding pairs with pups are most likely to depredate on sheep (Till and Knowlton 1983, Till 1992, Bromley and Gese 2001, Blejwas et al. 2002), and the same may be true for wolves and cattle. Sterilized coyote (Bromley and Gese 2001) and wolf (Mech et al. 1996) packs continue to maintain territories, and sterilization does not seem to adversely affect adult survival. In chronic areas, sterilization may reduce the need to remove problem wolves by keeping the wolf population low, and eliminating pup production (Haight and Mech 1997). Sterilization continues to be experimental and often controversial.

Mech et al. (1996) suggested that in areas sustaining chronic depredations on livestock by wolves, vasectomizing male wolves could potentially be part of an effective strategy to reduce such depredations. However, sterilization is not currently being used for GWDM and like other

sterilization techniques would be costly and difficult to implement on a large scale basis.

MFWP is not interested in this approach to GWDM (K. McDonald MFWP, Bureau Chief, Wildlife, pers. comm. 2012), the associated costs are high and implementation on a large scale is impractical. Consequently at the present time, neither MFWP nor Montana WS is proposing this action; therefore this alternative will not be analyzed further.

3.5.4 Nonlethal Before Lethal

Under this alternative, lethal techniques would not be used unless all reasonable nonlethal methods had been tried and failed to reduce damage. This alternative was not considered in detail because the proposed alternative as outlined in the EA is similar to a nonlethal before lethal alternative. WS, MFWP, and the Tribes encourage and consider the use of nonlethal methods before lethal methods (WS Directive 2.101). Therefore, adding a nonlethal before lethal alternative and the associated analysis would not add additional information to the analysis for the public or decision maker.

3.5.5 Agencies Exhaust All Nonlethal Methods Before Attempting Lethal Methods

Under this alternative all nonlethal methods would have to be attempted and proven ineffective prior to using lethal GWDM methods even though, in the professional judgment of WS and MFWP personnel, some methods that would have to be attempted would be impractical (*e.g*., would incur costs in excess of value of stock protected), inappropriate (*e.g.*, use of a light siren device in areas near other residences) or likely to be ineffective for the particular situation (*e.g*., situations where an animal appears to have habituated to human activity). This alternative will not be addressed in detail for a number of reasons including: 1) time and resources of agencies and individuals experiencing damage may be unnecessarily expended for the purpose of proving methods ineffective; 2) the potential that additional losses could be incurred while experimenting with nonlethal methods may be unacceptable to some and could result in an increase in individuals seeking to solve their own problems instead of working with WS, MFWP, and the Tribes; and 3) experimenting with nonlethal approaches may not be the most appropriate answer in the rare instance of a wolf-related risk to human safety.

3.5.6 Lethal Only Program

Under this alternative, WS would be limited to only providing technical and operational assistance with lethal damage management techniques. Prohibiting WS from using or providing technical assistance on effective and practical nonlethal GWDM alternatives is not in the best interest of the continued recovery of the species, is contrary to agency policy and directives (WS Directive 2.101), and will not be analyzed further. In certain situations, nonlethal methods may provide a more effective long term solution to wolf damage problems than lethal methods.

3.5.7 Technical Assistance Only

Under this alternative, WS would not conduct operational GWDM in Montana but could provide information to complainants about methods or techniques they could use to reduce wolf conflicts. WS would also be able to conduct investigations of potential wolf depredation sites as required to administer the wolf damage compensation program. The GW Plans was developed by the MFWP and states that it is committed to implementing the plan per statute (MCA §12.9.1301). MFWP could still use and authorize others to use nonlethal and lethal GWDM techniques. The environmental impacts of this alternative would be similar to impacts of Nonlethal GWDM Only option (3.2.2). Consequently, WS has determined that detailed analysis of this alternative would not contribute

substantive new information to the understanding of environmental impacts of damage management alternatives and has chosen to not analyze this alternative in detail.

3.5.8 Agencies Should Encourage Producers to Take Action to Prevent Wolf Depredation or Provide Funding for Damage Prevention Supplies and Equipment

Montana WS implements nonlethal abatement prior to depredations occurring when wolves are present near livestock. Wildlife Services' and MFWP also routinely give talks and presented material to the public on ways to prevent conflicts with wolves. WS has assisted MFWP with installing fladry, turbo fladry, electronic guards and flashing lights. The efficacy of some nonlethal methods declines as livestock are released onto grazing pastures and the herd begins to disperse over a much larger area. WS provides literature and when applicable recommends the use of livestock guard animals. WS has referred numerous ranchers to reputable livestock guard dog owners for advice or purchase of guard dogs.

WS and MFWP strive to prevent wolf damage and GWDM from becoming an undue burden on individual producers. However, there is a limit to Montana's funding for GWDM and most funds available for landowner assistance are used for the compensation program through the MLLB (see section 1.4.1). In some instances, agencies have been able to provide limited assistance with damage prevention materials. MFWP and WS will continue to explore new management methods and alternate funding sources and will examine whether there would be possible resources available to Montana producers in this program. Because of these reasons we have chosen not to analyze this alternative in detail.

3.5.9 Wolf Damage Should Be Managed by Hunters and Trappers

MFWP and Tribes have the authority to determine the role of hunters and trappers in GWDM. Montana has established regulations (See 2003 GW Plan and MCA 87-5-131) to use this strategy for addressing wolf damage and conflicts. BN has stated that it could be a possibility on their reservation to have a wolf hunting season, but have not set one up at this time.

WS supports general wolf population management by the use of hunters and trappers. However, difficulties with the use of hunters and trappers to manage site-specific depredation issues typically make it unreliable to stop damage situations. This is generally because hunters and trappers do not always have the time, resources, or training to promptly respond to site-specific damage problems with wolves. General hunting and trapping seasons do not target specific wolves causing damage. Additionally, most GWDM activities are conducted from April through September when pelts are not in prime condition which reduces the incentive for private hunters and trappers to participate in GWDM. Also, private citizens that lethally take wolves under shoot-on-site permits for depredation management currently must surrender the carcass to the respective authorities and cannot keep the pelts. This may reduce the incentive for non-affected hunters to get involved in depredation management. There may be situations where MFWP uses hunters or trappers to respond to livestock depredation complaints, following a process similar to that used in response to game damage. That process could involve maintaining a roster of hunters and trappers interested in responding quickly to a call if the situation warranted. They would then be licensed to take wolves within a limited geographical area for a set amount of time (K. McDonald, MFWP Wildlife Bureau Chief Pers. comm. 2012). Because this is a state action at the sole discretion of MFWP, this alternative doesn't require further analysis.

3.6 SOPS FOR WDM TECHNIQUES

SOPs improve the safety, selectivity and efficacy of WDM techniques. SOPs used by the WS program are discussed in detail in USDA (1997, Chapter 5). The following SOPs apply to some or all of the alternatives, as indicated in the columns below. These SOPs only describe actions by WS and do not include actions by other federal or state agencies. In some cases, if an action is not taken by WS, it may be implemented by another agency.

- Alternative 1 - Continue Current Adaptive Integrated GWDM in Cooperation with MFWP, Tribes, or USFWS (No Action, Preferred Alternative).
- Alternative 2 - Nonlethal GWDM Only.
- Alternative 3 - No Federal GWDM in Montana.

Figure 3-2. WS standard operating procedures under the various alternatives.

Standard Operating Procedures by Alternative	1	2	3
Procedures and Conditions for Conducting Gray Wolf Damage Management			
WS GWDM would follow guidelines as specified and agreed upon in the GW Plans and the most current MOU between MFWP and WS, or if under Tribes or USFWS wolf management, as outlined by them.	X	X	
WS would conduct GWDM only when and where a need exists.	X	X	
Wolf-dog hybrids could be killed by WS if they appear to be living in the wild and are unmarked.	X		
Lethal methods could not be used when wolves kill dogs that are free-roaming, hunting, or companion animals.		X	X
WS could use lethal methods to remove wolves in cases of threats to human safety.	X		
WS would not initiate use of lethal GWDM methods until discussions of nonlethal methods that might improve protection of livestock have been discussed by WS and the resource owner.	X		
Lethal depredation management activities would occur within specific areas as specified by MFWP as appropriate.	X		
All wolf mortalities while conducting GWDM and wolf population monitoring would be reported to the appropriate wildlife management agency.	X	X	
Wolves or wolf parts taken during GWDM may be transferred to MFWP or their designee or the Tribes at the discretion of the managing agency for cultural purposes, educational use, or scientific research purposes. The managing agencies will determine what WS will do with any specimens.	X		
Animal Welfare and Humaneness of Methods Used by WS			
Nonlethal GWDM methods such as guard dogs, scare devices, fladry and other methods, would be used and encouraged when appropriate.	X	X	
WS could authorize and train landowners and resource managers in the safe and effective use of nonlethal projectiles. These methods would be available to landowners and resource managers without specific authorization from the state agencies and training from state agencies or WS personnel.	X	X	
Wolf capture, handling, and euthanizing (if permitted) would be carried out in a humane manner.	X	X	
Traps, snares, and cable restraints would be checked consistent with WS/MFWP MOU and WS policy.	X	X	
Research would continue to improve the selectivity and humaneness of management devices and these would be implemented into the WS Program.	X	X	
Foot-hold traps would be equipped with pan-tension devices to reduce the incidence of smaller nontarget animal captures.	X	X	
All WS Specialists would be trained in the capture, chemical immobilization, and medical handling of wolves, to minimize accidental injury and death.	X	X	

Figure 3-2. WS standard operating procedures under the various alternatives.			
Standard Operating Procedures by Alternative	**1**	**2**	**3**
Nonlethal projectiles (*e.g.*, rubber bullets and bean bag projectiles) may be used if authorized by the appropriate managing agency.	X	X	
Nonlethal projectiles would not be used in a manner that would cause permanent physical damage or death to a wolf.	X	X	
Personnel would be trained in the safe and appropriate use of GWDM techniques and equipment.	X	X	
Safety Concerns Regarding Use of Traps and Cable Restraints			
The WS' Decision Model, designed to identify the appropriate WDM strategies and their impacts, is used.	X	X	
Traps and snares would be placed so that captured animals would not be readily visible.	X	X	
Warning signs would be posted on main roads or trails leading into any areas where traps, snares, or cable restraints were being used. These signs would be removed at the end of the damage management activities.	X	X	
No traps or snares would be used by WS within ¼ mile of any residence, community, or developed recreation site, unless granted permission from the owner of a privately-owned property or an official from the appropriate land management agency.	X	X	
Concerns About Impacts of GWDM Activities on T&E Species, Other Species of Special Concern and Cumulative Effects			
WS consulted with the USFWS on the impacts of the program to federally listed T&E species found in Montana and adopted Reasonable and Prudent Measures established by the USFWS for the protection of T&E species.	X	X	
WS personnel would attempt to resolve depredation problems by taking action against individual problem animals, or local populations or groups.	X	X	
Foot-hold traps or spring activated foot snares set near baits would incorporate tension devices to preclude capture of nontarget species.	X	X	
No foot-hold traps or cable restraints would be set within 30 feet of any exposed bait or animal carcass to prevent capture of nontarget species.	X	X	
No pesticides would be used by WS in GWDM operations.	X	X	
The USFWS, MFWP, or the appropriate land manager, as appropriate, would be notified as soon as possible, if a state or federally listed T&E species is caught or killed.	X	X	
Cultural Resources/Native American Concerns			
This EA has been provided to the Native American Tribes in a "pre-decisional" form to determine if cultural issues have been addressed.	X	X	X
On private lands within recognized reservation boundaries WS will ask the affected landowner if the appropriate reservation personnel can co-investigate any wolf complaint with WS. If allowed by the landowner, the tribe may co-investigate the complaint. WS and the tribe will consult regarding a course of action to address or resolve verified wolf complaints on these lands.	X	X	
WS will comply with requirements for notifying the tribes as per MOU between WS and perspective tribe.	X	X	
Public Land Issues			
On public lands, vehicle use would be limited to existing roads unless authorized by the land management agency.	X	X	
WS will meet annually with the land management agency to review Work Plans which include delineation of areas where certain methods may not be used, for all or part of the year.	X	X	
Public land agencies will review work plans for consistency with land and resource management plans.	X	X	

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.1. INTRODUCTION

Chapter 4 provides information needed for making informed decisions in selecting the appropriate alternative for meeting the purpose and need of the proposed action. NEPA requires Federal agencies to identify and assess the proposed action, such as GWDM, and reasonable alternatives to the proposed action that will avoid or minimize adverse effects of these actions upon the quality of the human environment (40 CFR 1500.2e). This chapter analyzes the environmental consequences of each of the alternatives discussed in Chapter 3 to meet the needs for action identified in Chapter 1 in relation to the issues identified for detailed analysis in Chapter 2. The environmental consequences of each alternative are compared with the proposed action to determine if the real or potential impacts would be greater, lesser, or the same. Therefore, the proposed action, the current program alternative, serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. It should be noted that the background and baseline information presented in the analysis of the current program alternative may also apply to the analysis of other alternatives.

Wolves will be present in Montana regardless of which alternative is selected (USFWS 1994, 71 FR 43410, 73 FR 10514, 74 FR 15123, the GW Plans), but conflicts with humans may vary by alternative and the different management philosophies and methods used under the various alternatives which could lead to different outcomes. The actual outcomes will result from MFWP, Tribes, or USFWS management decisions as provided for in USFWS (1994), 71 FR 43410, 73 FR 10514, 74 FR 15123, the GW Plans, court rulings, or legislative actions. These impacts are analyzed using the best available information and data. Additionally, USFWS will evaluate the wolf population status annually at least for 5-years following delisting to ensure wolves in Montana and the NRM are healthy and viable. If this analysis determines the wolf population might or is becoming threatened under current MFWP and Tribal management, the agencies would either adjust their management strategies to resolve those issues, or the process to evaluate listing all or parts of the NRM DPS under the ESA would begin. Throughout the range of the wolf, generally three factors dominate wolf population dynamics: food, people, and source populations (Fuller et al. 2003). These factors likely play the primary role in regulating the Montana wolf population.

Impacts of the alternatives are compared to the Current Program/No Action Alternative (CEQ 1981). CEQ (1981) guidance states that the "No Action" Alternative can be defined as being the continuation of current management practices. Data are available on the environmental impacts of the Current Program (the No Action Alternative, or Alternative 1), so the Current Program is used as the baseline for comparison with the other Alternatives to determine if the real or potential impacts are greater, lesser, or similar. Cumulative environmental impacts result from incremental consequences added to other past, present, and reasonably foreseeable wolf management actions by the USFWS, MFWP, CSKT, BN, other agencies or individuals based on USFWS (1994), 71 FR 43410, 73 FR 10514, 74 FR 15123, or the GW Plans. While impacts can be predicted, it is also possible for MFWP, Tribes, or USFWS to mitigate or lessen impacts based on how and when specific management strategies described for each alternative are implemented. A summary of the consequences associated with each alternative is presented at the end of this chapter (Table 4-4). MFWP, Tribes, USFWS, and WS intend to lessen the impacts to the Montana wolf population where possible while maintaining a secure and healthy population (USFWS 1994, 71 FR 43410, 73 FR 10514, 74 FR 15123, GW Plans).

The Montana Wildlife Commission has authority to classify wildlife under Montana Code MCA 87-1-301 and 87-1-304; the gray wolf was classified as endangered in Montana until February 2008 when it was federally delisted and reclassified as a "species in need of management." On August 5, 2010, the U.S. Federal District Court in Missoula, Montana, issued an order which vacated the delisting of the NRM

DPS of the gray wolf (Defenders of Wildlife et al. v. Salazar, CV 09-77-M-DWM and Greater Yellowstone Coalition v. Salazar, CV 09-82-M-DWM). In compliance with this order, wolves were again considered endangered throughout the NRM DPS except where they were classified as experimental populations (southern Montana, Idaho south of Interstate 90, and all of Wyoming)[28]. On April 15, 2011, the 2011 Federal Budget Bill that was signed by the President called for the delisting of wolves under the 2009 final rule (74 FR 15123 et seq.) and such reissuance could not be subject to judicial review. This legislation meant that the Service's 2009 science-based and peer reviewed delisting rule was again in force for the States of Montana, Idaho, eastern Oregon, eastern Washington, and north-central Utah. The USFWS will continue to manage wolves in Wyoming until the state has a Service-approved regulatory framework for wolf management. The 2009 rule determined that the NRM wolf population was biologically recovered and that management by the states, except for Wyoming, would ensure that the population remained recovered.

Montana statute (MCA 87-1-111) and Tribal GW Plans have penalties associated with illegal take of species in need of management. The GW Plans acknowledge that after delisting MFWP is the primary managing agency of wolves in Montana and will maintain a minimum of 15 packs as a safety margin over the 10 breeding pair minimum that was required for delisting (USFWS 1987, 1994). MFWP will manage wolves as a viable self-sustaining population that will never require relisting under ESA. Wolves are managed by "defense of property" regulations, similar to those that were in effect under ESA, and through regulated hunting since their delisting in 2011.

The 2003 GW Plan calls for the State of Montana to coordinate with WS to reduce depredation by wolves, depending on the number of wolves in the State and for a balanced educational effort to reduce depredations and conflicts through nonlethal means. On August 11, 2003, Montana released the 2003 GW Plan for public review and comment. That plan provided a detailed step-down management strategy for wolves and discussed how the population will likely remain well above 15 breeding pairs and provide hunting opportunities when the population was above that goal (the 2003 GW Plan).

Tribes are sovereign from State laws and manage wolves on their lands as they determine appropriate. However, the Tribal GW Plans do not have set goals for minimum or maximum numbers of wolves on their lands, but defer to MFWP to meet the minimum goals. The Tribes consult with MFWP to assist in maintaining these objectives. The Tribal GW Plans have penalties associated with illegal take of wolves as well as several objectives of the plans such as incorporating culture and tradition into wolf management, providing educational resources to residents, legally taking wolves, and mitigating losses from conflicts with wolves.

Human-caused mortality will be regulated as per the GW Plans to maintain a recovered wolf population. In 2005, the State of Montana completed a cooperative agreement paving the way for Montana to assume independent and full responsibility for wolf management and conservation statewide while they remained listed. Montana began implementing the state plan to the extent allowed by federal regulations throughout the state; MFWP's oversight was successful. Since the 2005 agreement, Montana's wolf population has increased from an estimated 256 wolves with 19 breeding pairs in 48 verified packs to a minimum estimate of 653 wolves with 39 breeding pairs in 130 verified packs of 2 or more wolves in 2011 (Hanauska-Brown et al. 2012).

[28] For a summary of relevant delisting and litigation activities that have transpired, see USFWS (2012*b*).

4.1.1 Background Important to the Analysis

4.1.1.1 Status of the NRM and Montana Wolf Population. USFWS (1987) initially specified a recovery criterion of a minimum of 10 breeding pairs[29] of wolves for a minimum of 3 successive years in each of three core recovery areas. USFWS (1994) subsequently revised wolf recovery parameters in the NRM to stipulate that "Thirty or more breeding pairs comprising some 300+ wolves in a metapopulation, with genetic exchange between subpopulations, should have a high probability of long-term persistence" because that population would contain enough individuals in successfully reproducing packs distributed over distinct but connected areas to be viable for the long term. In addition, the metapopulation configuration and distribution throughout secure suitable habitat (*e.g.*, YNP, NW Montana and central Idaho) would ensure that each core recovery area would provide a recovered population that would be distributed over a large enough area to provide resilience to natural or human-caused events[30] that might temporarily affect one core recovery area. USFWS (1994) further determined that a metapopulation of this size and distributed among the three core recovery areas within the identified NRM DPS would result in a wolf population that would fully achieve recovery objectives.

The USFWS conducted another review of what constituted a recovered wolf population in 2001 and 2002 (USFWS 2012*b*) to re-evaluate and update USFWS (1994). Experts strongly (78%) supported USFWS (1994) conclusions and agreed that wolf population viability was enhanced by higher (500 or more wolves) rather than lower population levels (300) and longer (more than 3 years) rather than shorter demonstrated time frames. The USFWS also determined that an essential part of achieving recovery was an equitable distribution of wolf breeding pairs[31] and individual wolves in Idaho, Montana and Wyoming and the three core recovery areas, and concluded that NRM wolf recovery and long-term wolf population viability is dependent on its distribution and the maintenance of the minimum numbers of breeding pairs and wolves.

Minimum recovery goals (an equitably distributed NRM wolf population that never goes below 100 wolves and 10 breeding pairs in Montana, in Idaho, and in Wyoming) have been exceeded in the NRM DPS every year since 2002 (USFWS 2012*b*), and as listed in the Federal and State recovery plans, all threats in the foreseeable future have been sufficiently reduced or eliminated in Idaho and Montana. Further, the State of Montana (MCA 87-5-31, 87-7-102, 87-1-130) adopted State laws and management plans (the 2003 GW Plan) that met the ESA requirements to conserve a recovered wolf population into the foreseeable future (73 FR 10514, February 27, 2008).

The NRM DPS occupies nearly 100% of the core recovery areas recommended in the 1987 recovery plan (*i.e.*, central Idaho, the GYE, and northwestern Montana) (USFWS 1987) and nearly 100% of the areas where suitable habitat was predicted to exist in Montana, central Idaho and the GYE (USFWS 1994). This pattern is expected to continue, because management plans for public lands in the NRM DPS result in forest cover, high ungulate densities, low to moderate road and livestock densities, and other factors critical to maintaining suitable wolf habitat. These

[29] Defined as two wolves of opposite sex and adequate age, capable of producing offspring and two offspring that survive until Dec 31 of the year.

[30] No wolf population of this size and distribution has gone extinct in recent history unless it was deliberately eradicated by humans (Boitani 2003).

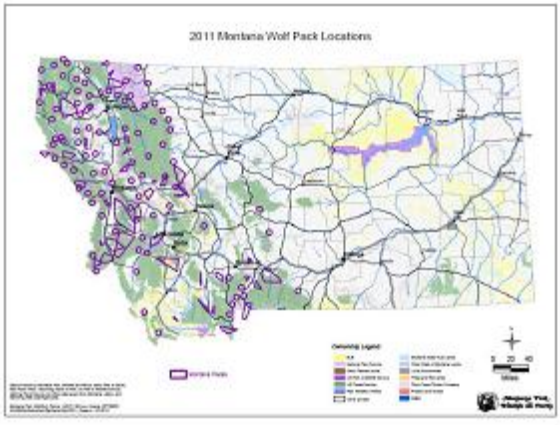
[31] Uniform distribution is not necessary. However a well-distributed population with no one State or recovery area maintaining a disproportionately low number of packs or number of individual wolves is needed to maintain wolf distribution in and adjacent to core recovery areas and other suitable habitat throughout the NRM.

goals were designed to provide the NRM gray wolf population with sufficient representation, resilience, and redundancy for its long-term conservation (73 FR 10514).

To ensure that the NRM wolf population continues to exceed the recovery goal of 30 breeding pairs and 300 wolves (USFWS 1994), the 2003 GW Plan committed to manage for at least 15 breeding pairs and at least 150 wolves each year and maintain its metapopulation structure

4.1.1.2 Wolf Habitat in the NRM and Montana. The USFWS used two models to identify wolf habitat (Oakleaf et al. 2006[32], Carroll et al. 2006[33]) which predicted different amounts of theoretically suitable wolf habitat in the NRM. Habitat quality for wolves is based on adequate prey and security from excessive human-caused mortality. State regulatory mechanisms in Montana, Wyoming and Idaho, and federal land management practices and guidelines restrict the location and extent of development on public lands, and these activities are not expected to substantially impact prey or wolf security (USFS 2006).

Figure 4-1. Wolf Packs in Montana 2011.



The area in the NRM DPS currently occupied by continual wolf packs was determined by circumscribing a line around the outer points of radio-telemetry locations of known wolf pack territories[34] (USFWS 2012*b*). The overall distribution of wolf packs has been similar since 2000, despite a wolf population that has more than doubled (USFWS 2012*b*; Bangs et al. 2009). In Montana, wolves are primarily distributed in the western area of the state (Figure 4-1) inhabiting private, tribal, and public lands[35]. The majority of Montana wolf packs live in areas where mountainous terrain and intermountain valleys are intermixed on varying land ownership (MFWP 2010). The average pack territory in Montana encompasses 27% private land. Montana wolf pack territory size estimates are variable and the calculation of territories is influenced by MFWP's ability to collect location data on pack members throughout the year. The maximum territory size calculated for a Montana wolf pack in 2011 was 480 mi^2, but most pack territories were found to be significantly smaller (Hanauska-Brown et al. 2012).

[32] In total, Oakleaf et al. (2006, p. 559) ranked 65,725 mi2 as suitable habitat in Montana, Idaho, and Wyoming

[33] Carroll et al. (2006) predicted the potential effect of increased road development and human density expected by 2025on suitable wolf habitat. Within the NRM DPS, Carroll et al. (2006) ranked 107,096 mi^2 as suitable including 40,924 mi^2 in Montana; 31,856 mi^2 in Idaho; 29,808 mi^2 in Wyoming; 2,556 mi^2 in Oregon; 1,655 mi^2 in Utah; and 297 mi^2 in Washington. Approximately 96% of the suitable habitat 102,588 mi^2 within the NRM DPS occurred in Montana, Idaho, and Wyoming. According to Carroll et al. (2006), approximately 28% of the NRM DPS is ranked as suitable habitat.

[34] The USFWS does not believe that any traditional land-use practices in the NRM DPS need be modified to maintain a recovered wolf population in the foreseeable future, because about 71% of the occupied habitat is in public ownership that is managed for multiple uses that are complementary with suitable wolf habitat and maintenance of viable wolf populations (Carroll et al. 2003, Oakleaf et al. 2006).

[35] Montana wolf packs are monitored year round with techniques that include direct observational counts, howling and track surveys, use of trail cameras, and public wolf reports. MFWP documents pack size and breeding pair status of known packs to: verify wolf activity in new areas that can result in new packs forming, document dispersal to the extent possible and assess connectivity, determine pack territories, and identify potentially affected private landowners. Wolf monitoring data, while not a precise accounting of the number of wolves in Montana, are used to make decisions to address wolf-livestock conflicts, to set wolf hunting and trapping regulations, and to set harvest quotas.

Montana contains portions of all three federal recovery areas: the Northwest Montana Recovery Zone, the central Idaho Recovery Zone, and the GYE. Northwest Montana and the GYE provide secure wolf habitat and abundant ungulate populations (USFWS 1994). These lands are generally not available for extensive development due to their land-use classifications, management guidelines for other species (*e.g.*, grizzly bears and Canada lynx), habitat, access, and geological characteristics (USFWS 1993, 1996, 2007; Serhveen et al. 2003; USFS 2006). Thus, these areas will continue to provide suitable habitat for a resident wolf population and will be a dependable source of dispersing wolves to help maintain a viable wolf population in the NRM (USFWS 1994). The Northwestern Montana recovery area has a core of protected suitable habitat (*i.e.*, Glacier National Park, the Bob Marshal Wilderness Complex, and extensive USFS lands). Wolves also disperse into northwestern Montana (and central Idaho) from Canada and some packs have trans-boundary territories, helping to maintain the wolf population in Montana and the NRM DPS (Boyd et al. 1995, MFWP 2010, Hanauska-Brown et al. 2012).

Montana's diverse landscape has been described as six ecosystems based on topography, climate and vegetation (Table 4-1). The gray wolf is a habitat generalist and historically occurred across all vegetation types in Montana where there was adequate prey. Hence, current day wolf habitat is defined more specifically by ungulate distribution and human settlement patterns (the 2003 GW Plan).

Enough habitat connectivity exists between occupied wolf habitat in Canada, Northwestern Montana, the GYE, and Idaho to ensure exchange of sufficient numbers of dispersing wolves to maintain demographic and genetic diversity in the NRM DPS (the 2003 GW Plan, Oakleaf et al. 2006, Carroll et al. 2006, VonHoldt et al. 2008, 2010, MFWP 2010, Hanauska-Brown et al. 2012). Wolf movement between Montana and Idaho has been documented with at least five wolves having dispersed into the GYE[36] (Pletscher et al. 1991, Boyd and Pletscher 1999, MFWP 2007, 71 FR 6634). In addition, the USFWS approved the 2003 GW Plan and the Idaho Wolf Population Management Plan (Idaho Legislative Wolf Oversight Committee 2002, IDFG 2008), and the Wyoming Plan (Wyoming Game and Fish Commission 2012) that commits all states to maintaining the metapopulation structure of the NRM DPS and sufficient genetic diversity[37], by various methods to ensure the long-term viability of the wolf population of the NRM DPS. These methods could include relocation of individual wolves.

Another important factor in maintaining wolf populations is the native ungulate population. Wild ungulate prey in these three areas is composed mainly of elk, white-tailed deer, mule deer, moose, and bison (only in the GYE). Bighorn sheep (*Ovis canadensis*), mountain goats (*Oreamnos americanus*), and pronghorn antelope also are common but not important, at least to date, as wolf prey. In total, 100,000-250,000 wild ungulates are estimated in each State where wolf packs currently exist (USFWS 1994); the States in the NRM have managed resident ungulate populations for decades and maintain them at densities that will support a recovered wolf population. The primary prey species for wolves in Montana are deer, elk, and moose (Boyd et al. 1994). Wolves have the potential to influence big game populations and their habitats. Monitoring the wolf and big game populations are important aspects of wolf management (MWFP 2012).

[36] Only one individual is known to have dispersed into YNP itself, probably because YNP is saturated with resident packs that would have a low tolerance for dispersing wolves (Boyd et al. 1995, VonHoldt et al. 2008, USFWS 2008, 2012*b*).

[37] The majority of the statewide increase in the minimum wolf count and number of packs continues to be in Wildlife Management Unit 1 (northwest Montana). One in 6 wolf packs occurred on the Blackfeet and Flathead Indian reservations, respectively. The increase appeared to be influenced by the geographic proximity of the robust Idaho wolf population.

The foundation of MFWP's habitat conservation efforts is "Habitat Montana" (the 2003 GW Plan). This program focuses on land conservation that benefits wildlife and maintains other natural resource values of private lands. MFWP administers a network of Wildlife Management Areas (WMAs) that are managed to benefit wildlife (wintering ungulates in particular) and to provide opportunities for public recreation. These lands are purchased using earmarked revenue collected from the sale of hunting licenses and matching federal revenues. Vegetation management objectives on many of these properties are met in part by livestock grazing through cooperative agreements with adjacent landowners. MFWP also participates in numerous federal habitat conservation programs, such as a Forest Legacy and Habitat Conservation Plans (the 2003 GW Plan).

Table 4-1. Six major ecosystems of Montana based on topography, climate and vegetation.

Ecosystem	Topography	Predominant Vegetation	Climate
Montane Forest	Mountainous	Forest, usually conifer dominated	Maritime in northwest ; continental in southwest
Intermountain Grassland	Intermountain valleys and foothills	Grasslands or agriculture	Continental
Riparian	Gentle to mountainous; adjacent to surface water (lakes, rivers, wetlands etc.)	Various; when forested, dominant tree/shrub cover is deciduous	
Shrub Grassland	Level, gently rolling; locally steep in the mountains; dissected river breaks	Shrubs dominate; deciduous trees or shrubs in wetter areas	
Plains Grassland	Generally flat to rolling; badlands; glaciated in the north	Shortgrass prairie, prairie badlands; agriculture	Semiarid; cold winters, warm summers; highly variable
Plains Forest	Uplands in plains areas; dissected; moderately steep	Forest, usually conifer	

Cattle and sheep are at least twice as numerous as wild ungulates, even on public lands (USFWS 1994). The only areas that lack livestock and are large enough to support wolf packs are YNP, Glacier National Park, some adjacent USFS Wilderness Areas, and parts of Wilderness Areas in central Idaho and Northwestern Montana. Consequently, every wolf pack outside these areas has interacted with livestock, primarily cattle. Livestock and livestock carrion are routinely used by wolves, but wolf management discourages chronic killing of livestock (USFWS 1994, 74 FR 15123, the GW Plans). Conflict between wolves and livestock has resulted in the annual removal of some wolves, but the Montana and NRM wolf population continues to increase and remains well above recovery levels in spite of these removals (Bangs et al. 1995, 2004, 2005; USFWS 2012*b*, MFWP 2008, 2009, 2010, 2011).

Wolf populations do not appear to be greatly affected by other human factors such as snowmobiles, vehicles, or logging activities, except when they result in accidental or intentional killing of wolves or changes to prey density (Fuller et al. 2003). Even when these factors have an adverse effect on individuals, these activities seem to have little effect on the wolf population where the wolf population is large enough to compensate for these types of losses (Fuller et al. 2003).

4.1.1.3 Human-Caused Wolf Mortality. Human-caused wolf mortality in 2010 included 141 wolves taken to address livestock predation (25% of the minimum population) and 0 wolves removed by sport harvest. Additional human-caused mortality included 1 (0.2%) legal harvest in Canada, 11 (2%) car/train strikes, 13 (2%) illegally taken, 3 (.5%) incidental and agency-related deaths, 1 (0.2%) taken in self-defense, and 9 (1.5%) dying from unknown causes (MFWP 2011*b*). Human-caused wolf mortality in 2011 included 64 (10%) wolves taken to address livestock

predation and 121 (18%) wolves killed during the Montana regulated wolf hunt. Additional human-caused mortality included 8 (1%) illegally taken,8 (1%) wolf deaths from car/train strikes (1%), 7 (1%) to natural causes, 2 (0.3%) to other causes, and 5 (1%) dying from unknown causes (Hanauska-Brown et al. 2012). This level of mortality has not inhibited the continued increase of the Montana or NRM wolf population over the same period.

Urban growth and development will continue in the NRM and Montana, including development and conversion of private low-density rural lands to higher density suburban and urban areas with increased roads, transportation facilities, resource extraction, and recreationists on public lands[38] (Robbins 2007). Despite efforts to minimize impacts to wildlife (Brown 2006), some developments will make areas less suitable for wolf occupancy. However, none of these developments and increased human presence will threaten wolf recovery or meaningfully impact the amount of suitable wolf habitat in the NRM in the foreseeable future (Robbins 2007, 73 FR 10514). Wolves are habitat generalists and one of the most adaptable large predators in the world, and only deliberately became extirpated as a result of social pressure to eradicate livestock predators across the United States in the late 1800s into the early 1900s (Boitani 2003, Fuller et al. 2003). Even active wolf dens can be resilient to nonlethal disturbance by humans (Frame et al. 2007). The vast majority of suitable wolf habitat and the current wolf population are secure in mountainous forested Federal public land. These lands will not be legally available for or suitable to intensive human development.

No significant threats to the suitable habitat in Montana or NRM are currently identified or predicted for the foreseeable future (73 FR 10514). These habitats currently support nearly 1,700 wolves and more than 111 breeding pairs. In addition, wolf reproduction has been confirmed in both eastern Washington and eastern Oregon (USFWS 2012*b*). The core recovery areas in the NRM have long been recognized as the most likely areas for successful metapopulations with dispersal between subpopulations (USFWS 1980, 1987, 1994; 71 FR 6634). Unsuitable habitat and small fragmented areas of suitable habitat away from these core recovery areas largely represent geographic locations where wolf breeding pairs are likely to persist, if at all, only in low numbers and are not important or necessary for maintaining a viable, self-sustaining, and evolving wolf population in the NRM DPS into the foreseeable future (Geffen et al. 2004). There is no foreseeable condition that would cause a decline in ungulate populations significant enough to threaten the recovered status of the NRM DPS (73 FR 10514).

4.1.1.4 Montana Statutes and MFWP Management Direction (the 2003 GW Plan). Gray wolves are thriving and expanding in number and distribution in Montana. More wild wolves are present in Montana now than probably at any time in the past 70 years and have met the biological requirements for recovery since 2002. Montana statutes charge MFWP with conservation and management of resident wildlife. MFWP developed the 2003 GW Plan using the Montana Environmental Policy Act (MEPA) as a tool to determine whether the state would assume management responsibility. The 2003 GW Plan is patterned after other MFWP big game species plans which have been a successful tool in managing these species.

[38] Wolves do not necessarily avoid roads, and in fact readily use forest and logging roads for travel corridors, but road density apparently provides a good measure of human contact which can result in illegal wolf mortality. Other measures of human contact or presence such as human population densities also correspond well to areas occupied by wolf packs (Fuller et al. 1992, Mladenoff et al. 1995). When wolves occur at low densities and large blocks of unoccupied suitable habitat are available, habitat and road density characteristics predict areas where wolves will occur (Mladenoff et al. 1995); however, as wolf densities increase vegetation and habitat characteristics do not predict wolf habitat as well as indices that measure human influence as long as prey is adequately abundant (Potvin et al. 2005).

MFWP recognizes the gray wolf as a native species and is committed to recovery of the species within Montana. The purpose of the 2003 GW Plan is to manage wolves consistent with Montana state laws, policies, rules, and regulations. MFWP implemented positive conservation and management strategies to ensure that all federal requirements were met to recover the species and integrate wolves into Montana's wildlife heritage.

MFWP also recognizes that the long-term persistence of wolves in Montana depends on carefully balancing the complex biological, social, economic, and political aspects of wolf management. MFWP considered the wide spectrum of interests in designing and implementing a program that is responsive to the opportunities and addresses the challenges faced by people directly affected by wolves. Managing gray wolves as a resident native species according to state guidelines will allow the program to be more flexible and adaptable in meeting the needs and interests of Montana citizens and visitors. MFWP believes that it is in Montana's best interest to recognize and take on the challenges, responsibilities, and benefits of managing a restored wolf population.

The 2003 GW Plan addressed wolf conservation and management anywhere wolves occur in Montana, except where management authority is otherwise explicitly reserved to other jurisdictions, such as Tribal Reservations and National Parks. Ultimately, the 2003 GW Plan is a strategy that is implemented through the combined decisions and actions of MFWP Commission, the seven MFWP administrative regional offices, MFWP's headquarters in Helena, MDOL, WS, local law enforcement or county authorities, and other cooperators.

Two Montana Titles describe the legal status and management framework for wolves. Title 87 pertains to fish and wildlife species and oversight by MFWP and Title 81 pertains to MDOL and its responsibilities related to predator control. The 2001 Montana Legislature passed Senate Bill 163 (SB163), which amended several statutes in both titles; SB163 is included as an appendix in the 2003 GW Plan.

The gray wolf remained listed as "endangered" under the Montana Nongame and Endangered Species Conservation Act of 1973 (§87-5-101 MCA) until wolves were delisted from the federal T&E species list. Montana Senate Bill 163 (2001) in effect called for removal of the species from the state list upon removal from the federal list. Therefore, separate action to delist the gray wolf under State statute by the Montana Legislature was not required. MFWP did need to update Administrative Rule 12.5.201, which listed state endangered species (AMD, 2005 MAR p. 2329, Eff. 11/24/05; AMD, 2008 MAR p. 2165, Eff. 10/10/08). Once removed from the state endangered species list, the gray wolf was classified as a species "in need of management[39]." As a species in need of management, MFWP and the MFWP Commission established the regulatory framework to manage wolves (§MCA 87-5-101 to 87-5-123).

SB163 also amended Montana Statute §87-3-130, entitled "Taking of Wildlife to Protect Persons or Livestock[40]." This amendment becomes effective only when federal protections are removed. As amended, this statute relieves a person from criminal liability for the taking of a wolf if the

[39] Management is defined in MCA §87-5-102 as: "the collection and application of biological information for the purposes of conserving populations of wildlife consistent with other uses of land and habitat. The term includes the entire range of activities that constitute a modern scientific resource program including but not limited to research, census, law enforcement, habitat improvement, control, and education. Also included within the term, when and where appropriate, is the periodic or total protection of species or populations as well as regulated taking." Under Montana statute, "take" means to "harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill wildlife". Thus, MFWP and the MFWP Commission established the management parameters and regulations that limit taking, possession, transportation, exportation, processing, sale, offer for sale, or shipment of wolves. In addition, MFWP and the MFWP Commission initiated the law enforcement, population monitoring, educational components, and other elements of a wolf program.

[40] Under Montana statue, the definition of livestock along with other animals includes: ostriches, rheas, and emus.

wolf is "attacking, killing, or threatening to kill a person or livestock." In addition, "a person may kill or attempt to kill a wolf or mountain lion that is in the act of attacking or killing a domestic dog." These changes are consistent with the concept of protecting human life and private property (livestock and pets) when they are in imminent danger. Individuals 'taking" a wolf must report any wolves killed or injured in defense of life/property to MFWP within 72 hours and surrender all wolf parts.

SB163 also deleted the gray wolf from the list of species designated as "predatory in nature" which are to be systematically controlled by MDOL (MCA §81-7-101 to §81-7-104). In other words, MDOL will not be required to exterminate wolves upon delisting. Instead, MDOL would control wolves for the protection and safeguarding of livestock, as long as the control action is consistent with a wolf management plan approved by both MFWP and MDOL. MFWP and MDOL cooperatively address and resolve wolf-livestock conflicts.

Montana statute and the 2003 GW Plan ensure that the Montana wolf population will remain viable and healthy and that the population will be maintained above ≥15 breeding pairs and 150 individuals consistent with the delisting rule. MFWP will also maintain balanced wolf and prey populations, ensure genetic transfer among recovery zones through maintaining connectivity and functional metapopulation processes, and manage wolves to minimize conflict with humans and domestic animals.

The long-term objective is to maintain viable wolf populations in Montana, achieve short-term harvest goals to reduce conflicts, provide annual harvest opportunity, and provide for non-consumptive benefits (*i.e*., aesthetics of wolves in the environment). Based on stakeholder input, the most important objective within the 2003 GW Plan is conflict resolution, when populations meet or exceed the population goal. Under the 2003 GW Plan, management flexibility becomes increasingly restrictive as the population approaches 150 wolves/15 breeding pairs. Ideally, the statewide population will not fall to a level where management of conflicts has to be restricted (e.g., <15 breeding pairs) (Table 4-2). Optimal hunting opportunity and flexibility in conflict resolution will be achieved by maintaining >15 breeding pairs. Fifteen breeding pairs is not an objective, nor is it a prejudgment about the population level of wolves necessary to avoid conflict.

4.1.1.5 Tribal Gray Wolf Conservation and Management Plans (Tribal GW Plans). The BN and CSKT Tribes have management plans for gray wolves on their lands which were approved in 2008 and 2009, respectively. The goal of the Tribal GW Plans was to address wolf conservation on their lands, conflict management, wolf harassment, capture, and take, and, research and monitoring, among other things. The Tribes determined that the reservations are too small to specify a number that would be maintained. However, the Tribes work with MFWP to ensure the long term viability of wolves in Montana.

4.1.1.6 Alternative Consistency with USFS LRMPs and BLM RMP's. Before an alternative can be considered for implementation on USFS or BLM lands, it must be consistent with the LRMP, often referred to as the *"Forest Plan"* or the BLM RMP. If the Alternative is consistent with the LRMP or RMP, no additional action is necessary by the USFS, BLM or WS.

If an alternative(s) is inconsistent with the LRMP or RMP and selected, the decision would not be implemented on USFS Forest System or BLM lands until the inconsistency was resolved either through amendment of the LRMP or RMP, or modification of the alternative(s). Any inconsistencies would be identified and resolved before the GWDM project is conducted. A work plan would be developed by WS with each National Forest and BLM District before any GWDM is conducted, or in the rare instance under *emergency control only.* If the selected

alternative is consistent with the LRMP or RMP, then wolf management on National Forest System and BLM lands would only be considered after consultation between the USFS, BLM, MFWP, and WS, as appropriate.

4.2 EVALUATING SIGNIFICANCE OF CUMULATIVE AND UNAVOIDABLE IMPACTS

Each issue analyzed in detail is evaluated under each Alternative and the direct, indirect, and cumulative impacts are analyzed. NEPA regulations describe the elements that determine whether or not an impact is "significant." Significance is dependent upon the context and intensity of the action. The following factors (adapted from USDA 1997) were used to evaluate the significance of impacts in this EA that relate to context and intensity for this proposal.

4.2.1 Magnitude of the Impact - Size, Number, or Relative Amount of Impact

Magnitude is defined in USDA (1997) as ". . . a measure of the number of animals killed in relation to their abundance" and may be determined either quantitatively or qualitatively[41]. Cumulative impacts to Montana's wolf population would include the legal wolf removals conducted by WS or MFWP personnel and livestock producers, hunter harvest (when allowed), natural mortalities, illegal killing of wolves, and any other known sources of mortality. The cumulative impact on Montana's wolf population will be considered in the context of the desired population level, as stipulated by MWFP and the Montana Fish and Wildlife Commission (the 2003 GW Plan) and the Tribes (Tribal GW Plans).

4.2.2 Duration and Frequency of the Impact

Duration and frequency of GWDM in Montana may be highly variable. Biotic and abiotic factors affecting wolf and other wildlife behavior affect the duration and frequency of GWDM activities conducted by WS in Montana. GWDM in specific areas may be longer duration projects, but the timing and frequency of individual actions may be highly variable depending upon any number of factors affecting the behavior of the animals that are causing damage and the location of the potential damage. GWDM would only be conducted by WS when a request for assistance is received, actions are conducted with concurrence from the MFWP, Tribes or USFWS, and a demonstrated need is present. Under the current MOU between MFWP and WS, MFWP wolf-take authorizations for livestock depredations are typically issued for a 45-day period following the most recent confirmed depredation.

4.2.3 Geographic Extent

GWDM could occur anywhere in Montana where wolf damage occurs or potential wolf management has been requested, agreements for such actions are in place, action is warranted as determined by implementing the WS Decision Model (Slate et al. 1992), and control has been authorized by MFWP. Actions would be limited to areas receiving damage from wolves (primarily rural sparsely populated areas), areas with historical wolf damage, areas where a threat of damage exists, or areas designated by MFWP to receive wolf control based on their assessments and management objectives. MFWP's wolf management plan clearly-defines boundaries for activities under the plan (the 2003 GW Plan).

[41] MFWP has identified a minimum number of wolves to ensure a viable, connected population. (MGWCMP)

4.3 ISSUES ANALYZED BY ALTERNATIVES

Under all the alternatives, wolf management in Montana is oriented toward resolving human-wolf conflicts when and where they occur while maintaining wolf recovery goals (USFWS 1994, 71 FR 43410, 73 FR 10514, 74 FR 15123, 2003 GW Plan). Wolves, in the act of, molesting or attacking livestock or domestic animals may be killed by livestock or domestic animal owners, their employees, agents and animal damage control personnel without a permit (USFWS 1994, MCA 87-3-130: ARM 12.9.1301-1305, the GW Plans). "Molesting", under either the USFWS, MFWP, or Tribal rules, does not actually require that a wolf be physically attacking livestock, but includes behavior which would indicate to a reasonable person that a wolf was about to attack the livestock. Wolves so taken shall remain the property of the USFWS, State of Montana, or the Tribe and must be reported to USFWS or MFWP within 72 hours with additional reasonable time allowed if access to the site where the take occurred is limited, BN in 24 hours, and CSKT in 12 hours. Livestock and domestic animal owners may take all nonlethal steps they deem necessary to protect their property. A permit is necessary from MFWP or Tribe to control wolves not molesting or attacking livestock or domestic animals.

Wolf numbers and distribution could fluctuate because of MFWP, Tribe or USFWS management actions, private citizens' actions, changes in prey abundance and distribution, disease and intraspecies strife (71 FR 43410, 73 FR 10514, 74 FR 15123, 2003 GW Plan)[42]. However, wolf occupation of nearly all suitable habitats would continue as wolves disperse from core areas and colonize new habitats with sufficient prey.

This section presents the expected environmental consequences of each alternative on each of the issues analyzed in detail. The following issues were determined to be relevant, and are analyzed in detail below:

- Effects on the wolf population in Montana
- Effects on nontarget species populations, including State and federally listed T&E species
- Effects on public and pet health and safety
- Humaneness and animal welfare aspects of the methods to be used

4.3.1 Alternative 1 - Continue with Current Adaptive Integrated GWDM in Cooperation with MFWP (No Action, Preferred Alternative)

Alternative 1 would continue the use or recommendation of a full range of legal, practical, and effective methods for preventing or reducing wolf damage while minimizing any potentially harmful effects of damage management measures on humans, the wolf population, other species and the environment as authorized and managed by the MFWP[43]. WS would provide technical assistance and operational GWDM using nonlethal and lethal management methods selected after applying the WS Decision Model (Slate et al. 1992), assist with wolf research and monitoring, and removal of wolf dog hybrids (for more about Alternate 1, see Section 3.2.1).

Wolf management in Montana and the NRM is oriented toward maintaining a sustainable wolf population while resolving human-wolf conflicts when and where they occur. Management policies do not authorize proactive adjustments of wolf numbers or distribution by WS as a result of human-wolf conflict management except where there are human safety concerns or conflicts with livestock

[42] The Montana wolf populations may be nearing saturated conditions where territoriality and pack density limit room for additional breeding pairs so that population growth can only be accommodated through range expansion (MFWP 2010).

[43] MFWP manages wolves as a game animal with a regulated public harvest as the primary population management tool (Letter to J. Steuber, WS from K. McDonald, MFWP, July 30, 2011).

and as authorized by MFWP. Human-wolf conflicts are usually addressed and resolved after damage has occurred. However, private citizens can opportunistically harass or can kill a wolf in the act of biting, wounding, or killing livestock, domestic pets, or people on private or public properties as allowed in the GW Plans.

Wolf numbers and distribution could fluctuate because of MFWP management actions, private citizens' actions, changes in prey abundance and distribution, disease, and intraspecies competition (71 FR 43410, 73 FR 10514, 74 FR 15123, 2003 GW Plan). It is possible that Montana resident's social tolerance for wolves could lead to management that stabilizes the population at a lower level or that the population will grow slower than predicted. However, wolf distribution will probably increase as individual wolves disperse from core areas and colonize new habitats with sufficient prey.

4.3.1.1. Effects on the Wolf Population in Montana. This alternative is currently implemented by WS under MFWP and Tribal authority. WS has developed expertise to conduct investigations of injured or dead livestock to determine if it was a predation event, and developed the capacity to respond to resolve and reduce losses caused by wolves[44] (the GW Plans, Letter to J. Steuber, WS from K. McDonald, MFWP, July 30, 2011). WS could provide technical and operational assistance with GWDM, as requested by MFWP and Tribes. WS implementation and use of adaptive integrated GWDM strategies under this alternative would continue under MFWP and Tribal supervision and as directed by the GW Plans which provide a framework for wolf management throughout Montana. Montana's wolf management goal is to ensure the long-term viability of the wolf population. Adaptive IWDM plays an integral role in learning about wolf population management and helping guide management efforts into the future. Under this Alternative, WS would be able to use a full range of legally available management methods to resolve human-wolf conflicts.

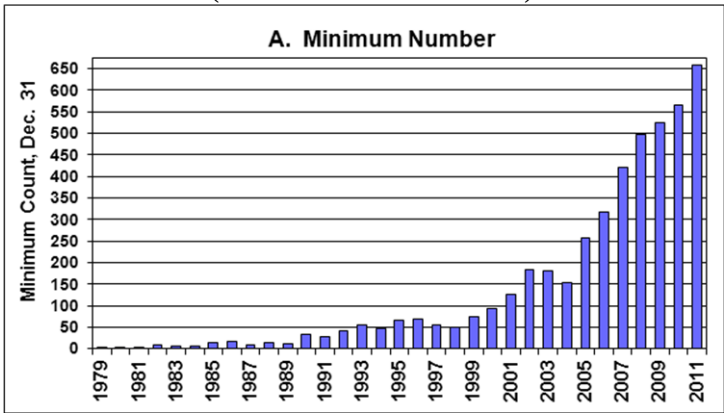
Montana's wolf population has grown steadily since about 1982 (Figure 4-2). At the end of 2011, the wolf population in the NRM and in Montana increased with a minimum estimated wolf population in Montana at 653, a 15% increase over 2010, in 130 verified packs of 2 or more wolves (Table 4-2) (Hanauska-Brown et al. 2012). Of the 130 packs, at least 39 packs qualified as breeding pairs. The minimum number of wolf packs has steadily increased from 46 in 2005 to 130 in 2011 and a total of 33 new packs were documented between 2010 and 2011(Hanauska-Brown et al. 2012). However, 11 packs that existed at some point in 2011 did not survive to the end of the year for a variety of reasons, including agency actions to reduce conflicts as directed by MFWP or Tribes, other human-caused mortality, and disease.

Table 4-2. NRM and Montana wolf population changes from 2006 to 2011.

NRM and Montana Wolf Population Changes			
Year	NRM Wolf Population	Montana Wolf Population	% Montana Change
2006	≥ 1,300 (USFWS 2012*b*)	316 (MFWP 2007)	+ 19%
2007	1,513 (USFWS 2012*b*)	422 (MFWP 2008)	+ 34%
2008	1,645 (USFWS 2012*b*)	497 (MFWP 2009)	+ 18%
2009	1,706 (USFWS 2012*b*)	524 (MFWP 2010)	+ 4%*
2010	1,651 (USFWS 2012*b*)	566 (MFWP 2011*b*)	+ 8%
2011	≥1,774 (USFWS 2012*b*)	653 (Hanauska-Brown et al. 2012)	+ 15%**
* This percent increase occurred during the first Montana wolf hunting season with a harvest of 72 wolves. ** This percent increase occurred during the second Montana wolf hunting season with the harvest of 166 wolves.			

[44] MFWP has indicated they would implement the lethal portions of their wolf damage management programs per the 2003 GW Plan with or without the help of WS (K. McDonald MFWP, pers. comm. 2012).

Figure 4-2. Estimated minimum number of wolves in Montana from 1979 to 2011 (Hanauska-Brown et al. 2012).



The GW Plans' goals are to quickly and efficiently resolve localized human-wolf conflicts while maintaining healthy wolf populations in Montana. One of the goals of MFWP is to resolve specific conflicts at specific sites (*i.e.*, livestock depredations) while maintaining a balance of wolf numbers and distribution within the constraints of the biological, social, and political landscapes[45]. MFWP recognizes the gray wolf as a native species and is committed to maintaining a wolf population at numbers sufficient to preclude reclassification as T&E under federal law. MFWP intends to honor the diverse perspectives and interests of the national public.

Montana considered the wide spectrum of interests in designing and implementing a balanced, responsive wolf management program that recognizes the opportunities and challenges faced by people directly affected by wolves (GW Plans). MFWP and MDOL[46], and Tribes work together, along with WS, to address and resolve human-wolf conflicts through a MOU. MFWP, in cooperation with MDOL, and the Tribes use WS to respond to landowner or livestock producer wolf depredation complaints, to conduct field investigations, and to carry out authorized management actions.

The relationship between the different forms of wolf take for damage management (*e.g.*, take by WS and take by land/property owners under permits) is highly interrelated and coordinated. Take by one of these entities is likely to reduce the number of wolves that will be taken by another entity. For example, if lethal GWDM by WS successfully resolves a problem on one ranch, an adjacent landowner may not need to take a wolf to reduce or prevent depredations. Conversely, landowner removal of a wolf caught in the act of depredation may reduce or eliminate the need for additional wolf removal by WS. Similarly, when wolves are removed through sport harvest, it could reduce the number of incidents of wolf predation on livestock and there would likely be fewer wolves taken by WS and private property owners during management actions.

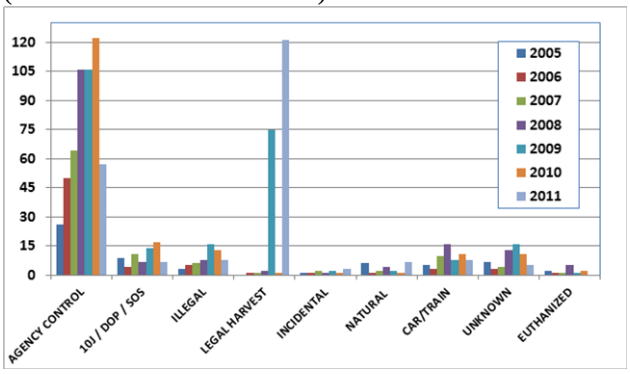
Hanauska-Brown et al. (2012) reported that most wolf mortality in Montana is from agency management actions, either through efforts to reduce livestock depredations or from regulated sport harvest (Figure 4-3). In 2011, 64 wolves were killed in Montana to reduce livestock

[45] Management implies that agencies are actively involved in activities which ensure long-term wolf population welfare and minimize the potential for conflict or to resolve human-wolf conflicts where and when they develop. Agency actions are aimed at matching the appropriate management action to the situation; "management" is not synonymous with lethal control. Wolf management includes a full range of nonlethal to lethal methods, as well as public outreach, conservation education, law enforcement, and landowner relations. MFWP, the Tribes, and WS recognize that wolves do not exist in isolation from their environment, nor should an effective management program isolate wolves from their environment.

[46] Two Titles within Montana statutes describe the legal status and management framework for wolves. Title 87 pertains to fish and wildlife species and oversight by MFWP. Title 81 pertains to the MDOL and their responsibilities related to predator control. Most recently, the 2001 Montana Legislature passed Senate Bill 163, which amended several statutes in both Titles.

depredations or the potential for further depredations[47] (Table 4-3). Of the 64, 7 were killed by private citizens under either state or federal regulations that allowed citizens to kill wolves seen chasing, killing, or threatening to kill livestock[48]. Of the known wolf mortalities in 2011, 64 (9.8%) were killed to address livestock related conflicts, 8 died due to illegal killing (1.2%), 8 accidental deaths (1.2%), 1 electrocution (0.2%), 1 legal take (0.2%), 121 (25.4%) were harvested during the regulated sport harvest season in 2011, 7 died of natural causes (1.1%) and 5 wolves died of unknown causes (0.7%)[49] (Hanauska-Brown et al. 2012).

Figure 4-3. Cause of wolf deaths necropsied by MFWP (Hanauska-Brown et al. 2012).



MFWP will continue to annually monitor and evaluate the wolf population to determine the wolf population status (the 2003 GW Plan). If the Montana wolf population became threatened under MFWP management, MFWP would adjust their management strategies (Table 4-2). Throughout the range of the wolf generally three factors dominate wolf population dynamics: food, human-caused mortality, and source populations (Fuller et al. 2003). These factors are monitored because they likely play a role in regulating the Montana wolf population.

Table 4-3. Estimated Montana wolf population, estimated mortality from all causes, percent mortality from damage management and percent population change from previous year (MFWP 2007, 2008, 2009, 2010, 2011, Hanauska-Brown et al. 2012).

Estimated Montana Wolf Population and Mortality						
Year	**Minimum Estimated Year-End Wolf Pop.**	**Estimated Mortality from Damage Management**[1]	**% of Mortality from Damage Management**	**Estimated Mortality from All Causes**	**% of Mortality from All Causes**	**% Change from Previous Year in Est. Wolf Pop.**
2005	256	42	21.8%	56	21.9%	-
2006	316	53	16.8%	71	22.5%	+23.4%
2007	420	73	17.4%	102	24.3%	+32.9%
2008	497	110	22.1%	161	32.4%	+18.3%
2009	524	145	27.7%	255[2]	48.7%	+5.4%
2010	566	141	24.9%	179	31.6%	+8.0%
2011	653	64	9.8%	216[3]	33.1%	+15%
Average	462	90	20%	149	31%	17%

1 Includes only wolves killed by WS employees and livestock producers to address wolf/livestock conflicts.
2 Includes 72 wolves harvested during the 2009 regulated sport harvest season.
3 Includes 166 wolves harvested during the 2011 regulated sport harvest season.

[47] Lethal removal of wolves in response to depredations might in some cases include removal of an entire pack, but there will likely also be cases where no wolves would be taken in response to depredations. These scenarios have existed for at least the most recent 6 years in Montana.
[48] Wolves that were attacking or harassing livestock or dogs can be legally killed under MCA 87-3-130 and ARM 12.9.1301-1305, shoot-on-sight permits issued by the USFWS or MFWP.
[49] This mortality is likely an underestimate of the overall mortality as documenting mortalities of uncollared wolves is difficult.

Impact to Wolves of Management Actions to Protect Resources

Under this Alternative, Montana WS, as requested by and coordinated with MFWP and the Tribes, would continue to recommend nonlethal management methods when deemed practical and appropriate, or could use lethal[50] methods to remove wolves as directed by MFWP. Additionally, livestock producers or their agents could legally shoot wolves to protect their livestock per the GW Plans or under the appropriate MFWP or Tribal permits. The level of lethal take of wolves by WS and landowners to protect livestock in Montana from 2005-2011 averaged 20% of the population, but was highest in 2009 at 28% of the minimum estimated year –end population and lowest in 2011 at 10%, a year with the highest sports harvest (Table 4-3). Using an average of about 90 wolves removed for livestock protection between 2005 and 2011, the number of wolves removed averaged about 20% of the annual end-of-year estimated wolf population with the minimum estimated year-end wolf population continuing to increase. WS assistance to MFWP and Tribes, and landowner take of wolves to reduce human-wolf conflicts is currently having a low magnitude of impact on the wolf population (the 2003 GW Plan). Cumulatively, mortality from all causes has also remained within levels that could be withstood by the wolf population. The average was 149 wolves killed from all causes or 31% of the minimum estimated year-end population with a high of 49% in 2009 (Table 4-3). However, the wolf population has increased annually from 2005 to 2011, averaging a 17% increase annually with a low of 5% in 2009, the year with the highest percentage of total mortality.

In 2005, MFWP expanded its responsibility for wolf conservation and management statewide with a new MFWP-USFWS interagency cooperative agreement and became the lead agency for wolf conservation and management in Montana (MFWP 2011*b*).

Unintentional Take of Wolves in Montana by WS

Unintentional take is the unintentional injury or death of wolves as a result of management activities. Sources of unintentional take from nonlethal GWDM methods could include death or injury of a wolf from a poorly placed or close range shot from a nonlethal projectile, potential injuries associated with aversive conditioning such as dog shock collars, and injury or death of wolves captured for population monitoring or attachment of collars used for nonlethal methods such as Radio Activated Guard boxes.

Nonlethal projectiles are among the methods available under this alternative. The most effective use of this method requires that the projectiles be used every time the wolf attempts to prey on the protected resource so the wolf does not identify conditions that allow them to obtain prey without receiving a negative experience (Shivik 2004). Consequently, this method is most effective when the landowner, resource manager(s), or caretaker (e.g. herder) assist with the implementation. Anyone using this method would be required to go through a training course on the safe and effective use of the technique. These projectiles can be deadly at very close range or if a vulnerable spot on the body is hit, although the likelihood of this type of injury is very low (Bangs et al. 2004). Based on past experience, risks to wolves from this technique are considered to be extremely low (<1 wolf death/5 years).

Some nonlethal techniques, such as Radio Activated Guard boxes and aversive conditioning with dog training collars require the placement of a transmitter collar on the wolf. Wolves are also captured and transmitter collars fitted as part of wolf research and population monitoring.

[50] Lethal methods are not needed at all sites where damage is confirmed nor are wolves always captured or killed at each damage situation.

Wolves are typically captured using aircraft and a dart gun or by foot-hold traps. Wolves are then anesthetized, collared, and released. The intent of this activity is not to harm wolves, but rather to gather information and release the animal unharmed. Injury to or death of a wolf from the capture, handling and anesthesia process can occur but incidence of these occurrences is very low. WS has assisted the USFWS and MFWP with these activities since the beginning of the NRM wolf program. WS Montana has not had a wolf die from capture related trauma/myopathy until the first half of FY12 when 2 wolves died during capture. Based on past experience and the use of trained personnel, WS anticipates no more than a few wolves dying per year from capture related trauma/myopathy for research and nonlethal GWDM activities.

Unintentional capture of young of the year wolves could result in injury, but not likely death, as pups would be released within 24 hours. Based on previous records of total annual take of young of the year (before and after 1 August) and anticipated increases in the Montana wolf population, we anticipate that no more than 1 young of the year wolf would be unintentionally captured prior to 1 August annually. This represents a worst-case scenario and actual take of pups is likely to be lower. Of the 1 young-of-the-year that could potentially be captured prior to 1 August, no pups are likely to be seriously injured or die. Because of their smaller size, risks to pups from GWDM activities may be greater than those to adults, but in the past, no pups have been unintentionally seriously injured during GWDM efforts by WS in Montana.

The occasional capture of a lactating female could cause incidental death of pups. However, during early lactation, the female generally remains close to the den, reducing risk of capture (Packard 2003). In addition, if pups are near weaning age other pack members will help feed them (Packard 2003). In the book Wolves – Behavior, Ecology, and Conservation it states, *"About 20-24 days after birth, the pups become mobile enough to explore as far as the mouth of the den. They begin to elicit care from other pack members (Murie 1944, Ryon 1977, Fentress and Ryon 1982), and they start ingesting solid food (Mech 1970). In another 2 weeks they are spending a lot of time outside the den and interacting with the adults"…. "At 3-5 weeks, suckling bouts average 3 minutes in duration and occur at an average of 5-hour intervals" (Packard et al. 1992)…."In the Ellesmere pack (in 1988), suckling bout duration declined to 1 minute, on average, at about week 9 (Packard et al. 1992). The intervals between bouts increased to an average of 10 hours until the pups no longer solicited nursing during week 10"…."By the age of weaning, pups are sufficiently mobile and have enough endurance to follow adults to carcasses (Gray 1993; L. D. Mech, unpublished data)*."

In general lactating females and pups are rarely captured in GWDM prior to August 1, and lactation is normally complete by late June. After mid-June through the end of September, pups are kept mainly at rendezvous sites and have restricted movements. Lactating females are likely to be captured only if the den sites are very close to the depredation site. The literature suggests that at about 8-10 weeks it is reasonable to assume that pup survival with the loss of the lactating female is likely. Additionally, since lactating females have restricted movements and the short window of vulnerability, the unintentional death of pups due to the capture of lactating female would be a relatively rare mortality factor for Montana wolf pups.

As discussed, WS assistance to USFWS, MFWP, and Tribes to reduce human-wolf conflicts has resulted in the unintentional take of 2 wolves since the beginning of gray wolf work in Montana. Since this is a rare occurrence and expected to remain a minimal mortality factor, WS anticipates that this will be, at most, a minor factor in their overall mortality and have little impact on gray wolves in Montana.

Intentional Take – Non-WS Entities

Montana WS would limit its use of lethal GWDM to periods when wolf damage is occurring, cumulative wolf take by all entities could continue so long as total take did not reduce the population below the management thresholds (the 2003 GW Plan). MFWP has stated that it would implement the additional GWDM measures including issuing permits to shoot or trap wolves to private landowners with verified depredations and plans to manage wolves as a game animal with a regulated public harvest as the primary population management tool (Letter to J. Steuber, WS from K. McDonald, MFWP, July 30, 2011). As with all other alternatives, landowners would be allowed to shoot wolves in the act of attacking domestic animals on their property or property they lease/manage and individuals would be able to kill wolves which pose an immediate and demonstrable threat to human life (the GW Plans). MFWP and Tribal staff or their designated agents could also remove wolves at damage sites.

The portion of the total annual take which may come from non-WS entities would vary depending on permits issued and sport harvest, and the alternative selected in this EA. If the statewide late-winter wolf population estimate exceeds 15 breeding pairs, then MFWP could authorize GWDM through the issuance of permits to land/resource owners. If the statewide late-winter wolf population estimate is below 15 breeding pairs then only nonlethal GWDM would be used (Table 4-2).

The GW Plans are intended to be a means of addressing damage problems while maintaining viable and healthy wolf populations throughout Montana. The goal of the GW Plans is to quickly and efficiently resolve localized wolf conflicts while maintaining healthy wolf populations. The aim of MFWP and Tribal GWDMwith WS assitance is not to annually remove the maximum number of wolves above an established threshold or to reduce the statewide wolf population but to resolve specific conflicts at specific sites.

Cumulative Impact on the Montana Wolf Population

Wolf populations are dynamic and can undergo major fluctuations (Hanauska-Brown et al 2012). Many studies have examined various levels of mortality and harvest and the impacts these mortality levels have on gray wolf populations. Wolf populations have sustained human-caused annual mortality rates of 30 to 50% without experiencing declines in abundance (Keith 1983, Fuller et al. 2003). Based on mean pack size of 8, mean litter size of 5, and 38% pups in packs, Boertje and Stephenson (1992) suggested 42% of juveniles and 36% of adults must be removed annually to achieve population stability. Mech (1970) suggests that more than 50% of wolves older than 5-10 months must be killed to "control" the wolf population, but other researchers have indicated declines may occur with human-caused mortality at 40% or less of fall wolf populations (Ballard et al. 1987, Peterson et al. 1984). Gasaway et al. (1983) reported stable wolf populations after early winter harvests of 16 to 24%, and wolf population declines of 20 - 52% after harvests of 42 - 61%. Ballard et al. (1997) suggests that the wolf population remained stable at 53% winter mortality, which included both natural and human-caused mortality. Using data from other regions of North America, winter harvests of wolves of 28-47% did not permanently reduce wolf populations available for sustainable harvest. Fuller (1989) observed stable or slight increases in the wolf population at an annual human-caused mortality rate of 29%. It appears that an average of 30 to 35 % human caused mortality of late fall or winter population can be tolerated by most wolf populations without causing population declines (Fuller et al. 2003), and populations can rebounded after population reduction is terminated (Mech 2001).

Haber (1996), however, reported that wolf populations may not be able to withstand repeated annual reductions of 25-50%. He believed these removals, in the form of hunting, trapping, and government control efforts, may have impacts on wolf population dynamics, social interactions, and the long-term health of the population. Haber also reported that it is difficult to fully understand the impacts of wolf exploitation because detailed comparative information on behavior from both exploited and protected wolf populations is scarce. Haight et al. (2002) modeled the impacts of various wolf removal strategies for GWDM including reactive removal (wolves removed after depredation occurs), delayed corrective removal (wolves removed in winter from areas with a history of wolf conflicts); and population size management (wolves removed annually from all territories near depredation sites). None of the strategies threatened wolf populations unless the wolf population was isolated. The model predicted that populations could withstand a sustained harvest of 20-25%. The authors considered this to be a conservative estimate and that the model likely underestimated compensatory factors in wolf population biology. In their analysis of multiple data sets, Adams et al. (2008) found human-caused mortality rates <29% did not cause wolf population declines.

Under this or any of the other Alternatives, it is reasonable to expect that MFWP adaptive management approach will ensure that the cumulative impacts on Montana's wolf population do not threaten the health and viability of the population (the 2003 GW Plan). The USFWS, through their approval of the 2003 GW Plan (73 FR 10514), has concurred that ensuring maintenance of at least 15 breeding pairs (~150 wolves) would provide for the long-term maintenance of a viable wolf population in Montana. Given that the Montana wolf population continues to increase, and increased at an average rate of 17% from 2005 to 2011 with active depredation management and a regulated sport harvest season (Table 4-2), the 2003 GW Plan has provided adequate protections and management guidelines to sustain a healthy and viable wolf population in Montana. Therefore, based on current and foreseeable wolf management in Montana, WS assistance to MFWP to reduce human-wolf conflicts will have a low magnitude of impact on the wolf population (the 2003 GW Plan).

4.3.1.2 Effects on Nontarget Species Populations Including State and Federally Listed T&E Species. Nontarget species can be impacted by GWDM whether implemented by WS, other agencies, or the public. Impacts can range from direct take while implementing GWDM methods to indirect impacts resulting from the reduction of predators in a given area. Measures are often incorporated into GWDM to reduce impacts to nontarget species. Various factors may, at times, preclude use of certain methods, so it is important to maintain the widest possible selection of GWDM tools for resolving damage problems. However, the GWDM methods used to resolve wolf damage must be legal and biologically sound. Often, but not always, impacts to nontarget species can be minimized. Where impacts occur, they are mostly of low magnitude in terms of nontarget species populations.

Under the Current Program Alternative in Montana, WS took relatively few nontarget species while conducting GWDM and those taken were of a size that could activate methods used in GWDM. Highest take of nontargets was associated with the use of snares and leghold traps. As PDM methods have improved in the last few decades, the incidence of nontarget lethal take has decreased. Nontarget species taken from FY07 to FY11 (Table 4-4) included 10 species with only 2 species taken lethally. The remaining 8 species were captured, but all were released alive. Of the 2 species taken lethally, a badger (*Taxidea taxus*) and a black bear, only one of each was killed. Both species are abundant in Montana and the take of 1 would not impact their populations. Additionally, minimal lethal take of any of the other species, except the grizzly bear (discussed below), would not have had an impact on their populations. The minimal lethal take of nontarget species also gives a good indication of the selectiveness of the GWDM methods used

by WS. Measures and SOPs to minimize nontarget impacts were described in Section 3.4 and 3.6. The SOPs have insured that nontarget take in WS GWDM remains relatively low. Nontarget species taken in Montana were recorded as unintentional targets and nontargets. Unintentional targets are listed on the agreement as a target species, but are taken unintentionally during efforts to take other target species. Just more than half the take was on properties where the target species was only wolves.

Minimal take may impact some species, primarily those species that are T&E species in Montana. WS has measures to minimize their take (discussed below). Montana WS does not anticipate any substantial increase in nontarget take under the proposed action and believes the current level of take is of minor significance to nontarget species populations.

On the other hand, WS could conduct projects for the benefit of other wildlife species including predator damage management to protect several different species where predation has been identified as a limiting factor. If predation were identified as a limiting factor for a wildlife species, especially one that was a T&E species, WS may determine that this would be a valid need for action. However, WS has determined that it would not conduct GWDM for the protection of other wildlife without further analysis and public participation.

Table 4-4. All nontarget species taken by WS during GWDM from FY07 to FY11 on all land classes in Montana.

Nontarget Species Killed and Freed by WS from FY07 to FY11 during PDM												
Fiscal Year	**FY07**		**FY08**		**FY09**		**FY10**		**FY11**		**Average**	
Species	**Killed**	**Freed**	**Killed**	**Freed**	**Killed**	**Freed**	**Killed**	**Freed**	**Killed**	**Freed**	**Killed**	**Freed**
Black Bear	-	4	-	1	-	2	-	4	1*	1	**0.2**	**2.4**
Grizzly Bear	-	1	-	-	-	-	-	-	-	-	**-**	**0.2**
Badger	-	-	-	-	-	-	-	-	1	2	**0.2**	**0.4**
Feral-Free Dog	-	1	-	-	-	-	-	-	-	1**	**-**	**0.4**
Coyote	-	3	-	1	-	-	-	-	-	1	**-**	**1.0**
Red Fox	-	1	-	-	-	-	-	-	-	2	**-**	**0.6**
Mountain Lion	-	-	-	-	-	-	-	-	-	1	**-**	**0.2**
Bobcat	-	1	-	-	-	-	-	-	-	1	**-**	**0.4**
Mule Deer	-	-	-	-	-	-	-	-	-	1	**-**	**0.2**
Pronghorn	-	-	-	-	-	2	-	-	-	-	**-**	**0.4**
TOTAL	**0**	**11**	**0**	**2**	**0**	**4**	**0**	**4**	**2**	**10**	**0.4**	**6.2**

* Shot by landowner prior to the arrival of WS Specialist and turned over to MFWP
** Landowner's dog

Consideration of Impacts to T&E and Sensitive Species in Montana. USFWS, MFWP, Tribes, and several other agencies monitor several species considered threatened, endangered, or sensitive (Tables 2-1 and 2-2) that potentially could be impacted by GWDM. These agencies monitor these species' populations to determine if different activities, singly or combined, are impacting them, a cumulative impact analysis. Mortality for T&E and sensitive species is monitored where feasible. But mortalities due to road kills, loss of habitat (i.e., land development, construction, housing, industrial complexes, road, mining, and oil and gas development), and natural disasters (i.e., fires, floods, lightning, heavy winters, and drought) would be the same under all alternatives (*environmental status quo*) and much of this activity that results in mortality or population limiting factors is difficult to determine. These factors are not likely to be determined sufficiently, even with unlimited funding, and, thus, can only be estimated based on how well a population is doing (increasing, decreasing, stable). The availability of habitat is often the most critical concern because the available habitat determines the number that an area can support. WS consults with these agencies, as necessary, to provide them with information regarding WS's potential to take or benefit these species with GWDM.

WS has the potential to adversely impact 22 T&E or sensitive species in Montana (Table 2-1 and 2-2), but did not negatively impact any of these species from FY92 to FY11 in the range where they are considered sensitive. In fact, only 1 grizzly bear was taken in GWDM, but released alive. Thus, GWDM did not have an impact on any T&E species. WS anticipates that GWDM will continue to have only minimal potential to adversely impact T&E or sensitive species. However, even if WS has additional GWDM projects as the wolf population continues to expand, WS does not anticipate that it will have significant adverse impacts on listed species. WS would consult with USFWS under Section 7 of the ESA if it anticipated the take of federally listed T&E species.

Measures to avoid T&E and sensitive species impacts were described in Section 3.6. Those measures should ensure that the proposed action will minimize GWDM impacts on T&E species. In fact, pan-tension devices and snare stops nullify the potential to take most species listed in Table 2-2 with the exception of possibly the Golden and Bald Eagles. Of the federal and state listed T&E or sensitive species occurring in Montana, it was determined that GWDM could adversely affect only terrestrial vertebrate species (mammals and birds). Because GWDM methods will not affect water or wetlands, Montana's T&E fish and amphibian species were not considered. Since WS PDM will not modify or impact habitat to any extent, T&E invertebrates and plants were also not considered. Finally, no reptiles are large enough to activate snares or traps. Of the species listed in Tables 2-1 and 2-2, disregarding species that only have the potential of being taken in leghold traps without pan-tension devices, WS GWDM has at least the potential to take a wolverine, grizzly bear, Canada lynx, fisher, Bald Eagle, and Golden Eagle. WS believes that, with the use of pan-tension devices on leghold traps, none of the smaller (<10 pounds) wildlife species will be taken and GWDM will have no effect on them. Additionally, WS has not taken any of the other species in GWDM from FY92 to FY11[51].

Grizzly Bear

Grizzly bears are among the largest terrestrial mammals in North America. South of the United States - Canada border, adult females range from 250-350 pounds and adult males range from 400 to 600 pounds. Grizzly bears are relatively long-lived, living 25 years or longer in the wild. Grizzly bears are omnivorous, opportunistic feeders that require foods rich in protein or carbohydrates in excess of maintenance requirements in order to survive seasonal pre-and post-denning requirements. Grizzly bears are homeo-hypothermic hibernators, meaning their body temperature drops no more than five degrees C during winter when deep snow, low food availability, and low ambient air temperatures appear to make winter sleep essential to grizzly bears' survival (Craighead and Craighead 1972a, 1972b). Grizzly bears excavate dens and require environments well covered with a blanket of snow for up to five months, generally beginning in fall (September-November) and extending until spring (March-April) (Craighead and Craighead 1972b; Pearson 1972). Thus, GWDM during the winter months is unlikely. Additionally, the majority of GWDM activities conducted under the proposed action will occur on private property below 5,000 feet in open livestock grazing areas, mountain valleys, open prairies, high desert, or sagebrush habitats. In elevation above 5,000 feet, outside of the prime grizzly bear habitat. In fact, in the last 20 years, WS only took one grizzly bear incidentally and it was associated with GWDM. The grizzly bear was released unharmed, and thus, no mortality has been associated with GWDM.

[51] The MIS has data from FY92 to present. Thus, take can easily be analyzed for this time.

Since WS had the potential for take, WS consulted nationally on the incidental take of grizzly bears (USDA 1997, Appendix F). More recently, WS initiated consultation on the grizzly bear in 2010. The USFWS issued a BO on June 8, 2012 with an incidental take statement with terms and conditions and Reasonable and Prudent Measures required of WS to minimize the potential to take a grizzly bear. WS abides by these and anticipates that few grizzly bears will be taken, if any.

Wolverine, Fisher, and Canada Lynx

The wolverine, a large member of the weasel family (Mustelidae), resembles a small bear with a broad rounded head, short ears, small eyes, a bushy tail, and 5 toes. Adult males weigh 26 to 40 pounds while adult females weigh between 17 and 26 pounds. Wolverines are opportunistic feeders, consuming a variety of foods depending on availability. They primarily scavenge carrion, but also prey on small animals, birds and insects and eat fruits and berries when available. Wolverines have an excellent sense of smell, enabling them to find food beneath deep snow. Wolverines have large spatial requirements with the availability and distribution of food the likely primary factor in determining wolverine movements and home range. Home ranges of wolverines are generally extremely large, but vary greatly depending on availability of food, gender, age, and differences in habitat. Wolverines can travel long distances over rough terrain and deep snow. Wolverines are animals of high alpine environments in both North America and Eurasia. In North America, they occupy western mountains in Alaska and Canada, extending south into Washington, Idaho, Montana and Wyoming.

Fishers are a medium-sized mustelid weighing from 3 to 12 pounds. They have a long slim body, more like other weasels compared to the wolverine. They prefer extensive areas of mixed hardwood forests and wilderness areas.

The lynx, a medium sized member of the cat family, is similar to the bobcat (*Lynx rufus*), but grayer pelage, larger feet, and larger tufts on their ears. Their feet make them adapted to living in areas with deep snows. They seem to prefer heavily forested areas near timberline, especially those in remote areas such as wilderness. Its range in the United States includes the high country of western Montana where its main prey, the snowshoe hare (*Lepus americanus*), is found. Most lynx weigh between 15 and 30 pounds.

Wolverines, fishers, and lynx would be susceptible to methods used in GWDM including snares, leghold and cage traps, and guard dogs. However, their preferred habitat of higher elevation areas, densely forested areas, and remote areas makes it unlikely that they would be encountered because WS conducts little GWDM in these areas of Montana. The use of shooting is most frequently used GWDM method at higher elevations. Wolverines, fishers, and lynx would more likely be encountered during treks between areas. WS personnel remain watchful for sign of wolverines, fishers, and lynx, and will not set equipment (snares and traps) conducive to lethally taking them in these areas. Leghold, snares, and cage traps will be monitored frequently to ensure that any wolverine or lynx taken could be released. Thus, WS has determined that in the unlikely occurrence of encountering a wolverine, fisher, or lynx in Montana, the use of GWDM methods by WS could possibly take one. However, it should be noted none have been taken from FY02 to FY11, indicating the relative rarity of the potential to take one in GWDM in Montana**.** Montana WS does not expect that it will take any of the three species, but has consulted with USFWS on the Canada lynx, the only species federally listed. That consultation resulted in the issuance of a BO on July 24, 2009 by the USFWS that the effects of the statewide WS' wildlife

damage program in Montana on Canada lynx are not likely to jeopardize the continued existence of this species. The USFWS anticipated that one lynx may be taken over the next 35 years as a result of WS conducting WDM activities in Montana. USFWS issued an incidental take statement with terms and conditions and Reasonable and Measures required of WS to minimize the potential to take a lynx. WS abides by these measures.

Golden Eagles and Bald Eagles

Two species of raptors listed as sensitive could be impacted by GWDM. The golden eagle is common throughout Montana while Bald Eagles are more common in western Montana, but can be found statewide during winter months. The Golden Eagle is a generalized predator feeding on rodents, rabbits, and other medium-sized mammals, snakes, birds, and carrion. They are typically found in hilly or mountainous areas nesting in cliffs and hunt open grasslands and other similar habitat. Bald eagles are generalized predators/scavengers primarily adapted to edges of aquatic habitats. They feed primarily on fish (taken both alive and as carrion), waterfowl, mammalian carrion, and small birds and mammals. It is a bird of aquatic ecosystems, frequenting estuaries, large lakes, rivers, reservoirs and some seacoast habitat.

Exposed carcasses or other trap lures with traps set at them can negatively affect these species, because of their weight which averages about 10 pounds or more. However, WS has SOPs that minimize the potential for take. The Breeding Bird Survey conducted annually shows nonsignificant increasing trends for the Golden Eagle and significant increasing trends for the Bald Eagle in Montana and the surveywide area from 1966 to 2010 (Sauer et al. 2011). This suggests, but not definitive because raptor trends are necessarily reflective of their populations, that WS GWDM has had no impact on either population. Additionally, WS did not take any Bald Eagles from FY92 to FY11 and no Golden Eagles in GWDM. WS took 5 golden Eagles during coyote damage management in the same time frame in leghold traps and snares with 4 released alive and 1 taken lethally. Thus, this take is very minor over 20 years and not expected to impact the populations of either species. Given the fact that WS has not had any Golden Eagle and Bald Eagle take associated with GWDM, and the potential for take is minimal, WS anticipates that it will not have an impact on the Golden or Bald Eagle populations.

4.3.1.3 Effects on Public and Pet Health and Safety. USDA (1997) conducted a formal risk assessment of methods used under Alternative 1 and concluded that, when traps, snares, aerial gunning, firearms, immobilizing and euthanasia drugs, and frightening devices are used by trained and authorized personnel, in accordance with applicable laws, regulations, and agency policy, these methods pose minimal or no risk to public and pet health and safety. The greatest risks to public and pet health and safety from the use of GWDM techniques are incurred by the individuals who use these methods. WS use of GWDM methods has not resulted in any known injuries to people and rarely in pet injuries. In fact, from FY07 to FY11 (Table 4-4), only two dogs were captured in traps, with one being the landowner's, and both were released without injury.

Leghold and cage traps, and snares have the highest incidence of taking nontargets including pets of the methods used in GWDM. These methods pose, at most, a minimal threat to people. Since they are checked frequently, they are not likely to cause more than minor injuries to pets. WS strategically places traps and snares to reduce the likelihood of exposure to the public and pets, and pan-tension devices are used on all traps (Phillips and Gruver 1996, Turkowski et al. 1984). Additionally, appropriate warning signs are posted at access points to areas or properties where traps or snares are set to alert the public of their presence. Most dogs trapped by WS are those that are running at large or feral.

WS aerial operations employed in GWDM typically occur in relatively remote areas with no or very low human presence on the ground. USDA (1997) found very little, if any, risk to the public from WS aerial gunning activities. Other prior analysis of aircraft accidents by WS has concluded that the accident rate for WS pilots and aircraft is not significantly different from rates reported for general aviation and that the risk of harming any member of the public is exceedingly low (WS 2005). In fact, the actual risk of accidents by WS was found to be lower than that of general aviation, even though WS flies at low altitudes. WS pilots are extensively trained which includes spending many hours in a flight-simulator to minimize the potential for accidents.

Firearm use is a very sensitive issue and a public concern because of fears regarding the potential for misuse of firearms. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program prior to using firearms on the job and a refresher course every 2 years afterwards is required (WS Directive 2.615). All firearm safety precautions are followed by WS when conducting damage management and WS complies with all laws and regulations governing the lawful use of firearms. Shooting with shotguns or rifles would be used to reduce wolf damage when lethal methods are determined to be appropriate and firearms would be used to euthanize captured wolves in a humane manner. WS employees who use firearms as a condition of employment are required to certify that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of the misdemeanor crime of domestic violence.

Drug delivery systems, dart guns, blowguns, and jab sticks, are also used in GWDM. Employees must be certified to use these as well as the drugs. The primary drug used in GWDM is Telazol®, a proprietary drug that is a combination of tiletamine and zolazepam. Tiletamine belongs to a class of drugs known as dissociative hypnotics which works by disrupting the central nervous system to induce a cataleptic state. Zolazepam alone provides only subtle evidence of its presence, unless high doses are given. However, when combined with tiletamine, a composite state of immobility, muscle relaxation, freedom from reflex movement, and analgesia prevails. This state provides conditions suitable for handling the wolf without stress, various diagnostic and therapeutic interventions, and collaring a wolf. The maximum distance a dart gun can be shot (100 yard maximum with the effective distance about half), requires the target to be positively identified. A great deal of effort is spent retrieving darts that are fired to ensure a dart is not left in the field. In addition, the amount of drugs used and inventory are monitored to ensure that they are not used illicitly.

On the other hand, this Alternative could provide relief from damage or threats to public and pet health and safety from aggressive wolves deemed a threat to their well-being. Many people directly affected by wolf depredations on domestic animals, especially pets that are killed in their yards, express concern for human safety and insist upon the removal of wolves from their property when they cause damage. Wolves that have become habituated to humans are unpredictable and may attack people or pets (Section 1.3.3, Linnell et al. 2002, McNay 2002, MSNBC 2010). In many situations where wolves may pose a risk to health and safety, management of human behavior and nonlethal techniques may be sufficient to resolve the problem; however, in some situations, removal of the problem individual may be the only safe solution (the 2003 GW Plan). Perceived threats to human safety from wolves would continue to receive a high priority response from MFWP or Tribes with WS assistance under this Alternative.

4.3.1.4 Humaneness and Animal Welfare Aspects of the Methods to Be Used. WS personnel are experienced and professional in their use of GWDM methods. Under this Alternative, wolves

would be trapped, snared, shot, or drugged by experienced WS personnel as humanely as practically possible and in compliance with WS Directives 2.101, 2.335, 2.450, 2.505. Traps and snares are strategically placed by WS personnel to reduce the likelihood of exposure to nontarget wildlife, and the public and pets. Pan-tension devices are used on all traps to reduce risks to nontarget species and smaller pets (Phillips and Gruver 1996, Turkowski et al. 1984) and are checked in accordance with the 2003 GW Plan.

Some individuals would consider this Alternative inhumane because they oppose all lethal methods of damage management. Others will be opposed to this Alternative because they object to specific GWDM methods like traps and snares and perceive these methods as being unjustifiably inhumane. Some individuals may prefer that only non-injurious methods such as cage traps be used to capture wolves and would perceive this method as being more humane than foot-hold traps and snares. Unfortunately, the use of cage traps to capture wolves is both impractical and ineffective because it is extremely difficult to get a cage trap large enough for an adult wolf into remote locations, and because it would be highly unlikely to capture an animal as wary as an adult wolf in a cage trap. In addition, cage traps often cause injuries to animals trying to escape.

On the other hand, people with animals that have been injured, threatened or killed by wolves may see this Alternative as being more humane because it reduces the likelihood of continued killing or injury to domestic animals and potentially people. To see more discussion on humane and inhumane refer to Section 2.3.4

4.3.2 Alternative 2 – Nonlethal GWDM Only

4.3.2.1 Effects on the Wolf Population in Montana. Under this alternative, WS would not conduct or recommend any lethal wolf management and would have no intentional take of wolves for depredation management, therefore would have no negative impact on the Montana wolf population. However, the GW plans allows Montana and Tribal landowners and livestock producers to haze, harass or kill a wolf that is molesting or attacking livestock or domestic animals, and people may shoot wolves in defense of human life with the provision that all such incidents must be reported MFWP within 72 hours (MCA 87-3-130), the BN in 24 hours, and CSKT in 12 hours. Additionally, MFWP, Tribes, Federal land management agencies, or their designated agents, may take a wolf to relieve suffering of a sick, injured, or orphaned wolf. MFWP and Tribes would most likely continue to assist some landowners with taking depredating wolves and issue wolf kill permits to landowners and livestock producers who have experienced wolf predation. MFWP and Tribes could also exercise their authorities to remove wolves where they have caused human-wolf conflicts, and continue to administer a regulated public hunting and trapping season for wolves[52]. As discussed under Sections 4.3.1.1, under the adaptive management approach being followed by MFWP and Tribes, if wolf removal by one approach is reduced, it would likely be compensated for by increasing wolf removal through one or more other approaches. If WS were not taking any wolves through lethal management, MFWP and the Tribes would conduct more lethal control or authorize additional take by other means in an attempt to compensate for the reduced take by WS. Thus, in all likelihood, about the same number of wolves would be taken under this Alternative or possibly more. If MFWP were unable to keep up with the workload, it is possible that hunting seasons would become more liberal to

[52] MFWP manages wolves as a game animal with a regulated public harvest as the primary population management tool (Letter to J. Steuber, WS from K. McDonald, MFWP, July 30, 2011).

reduce the number of potential conflicts or inexperienced agents working for the MFWP or the Tribes may need to take more wolves to get the targeted wolf.

WS would continue to assist with the MLLB compensation program for wolf damage to livestock and could conduct nonlethal GWDM. With authorization from MFWP or Tribe, WS could use nonlethal projectiles, aversive conditioning (*e.g.*, dog training collars, Radio Activated Guard boxes, etc.), and any other experimental nonlethal GWDM methods; fladry could be used without special authorization. Most nonlethal methods included in this alternative have been and are currently available to reduce wolf depredation on livestock in Montana. Improvements in animal husbandry practices and the utilization of other nonlethal GWDM methods such as livestock guarding animals have the potential to reduce wolf damage, at least temporarily, and resource owners would be encouraged by WS to implement these techniques, as appropriate. However, these methods are not always effective and may not be appropriate (*e.g.*, the use of some noise-making frightening devices may be incompatible with land uses on adjacent properties or where a wolf has attacked or killed a person, albeit a rarity). Bangs and Shivik (2001) reported that while nonlethal methods can be effective, many were expensive to implement and none were widely effective. Consequently, individual(s) experiencing damage would likely seek lethal damage management alternatives in addition to or instead of recommendations offered by WS.

If WS selects this alternative, MFWP has indicated they would implement the lethal portions of their GWDM program (K. McDonald, MFWP, Wildlife Bureau Chief, Pers, Comm. 2012 and the 2003 GW Plan). However, MFWP has limited financial resources and assigning state agency staff to conduct the lethal portions of their GWDM program would likely come at the cost of other programs and projects. This would probably result in a shift of MFWP staff from wolf research and population monitoring to GWDM. Wolf research would probably only be conducted to obtain the minimum information necessary to meet the 2003 GW Plan monitoring requirements. While biologists with MFWP are trained wildlife management professionals, they do have multiple demands on their time and may not be able to respond to requests for help as promptly as the current WS program. This could result in perceived difficulties with GWDM assistance which may, in turn, reduce landowner tolerance of wolves and result in a potential increase in illegal take (Treves and Naughton-Treves 2005). Illegal actions by private individuals are less likely to be very specific (e.g., illegal poisons), and could potentially have more adverse impacts on the wolf population than focused lethal actions by trained, authorized professionals. MFWP or Tribe could designate other individuals or organizations to serve as agents of the state to aid with lethal GWDM projects. MFWP could also increase use of shooting and trapping permits for people who have lost animals or those with vulnerable livestock and other domestic animals. The Tribes would also likely issue an increased number of permits. Non-WS entities may not have the same training, resources, or access to research assistance as WS making their efforts less effective, and may also have difficulties in responding to damage problems. Capturing a specific wolf or wolves associated with a depredation problem can be difficult. Individuals with less experience than WS staff may not be as successful in removing wolves associated with damage problems.

Demands on MFWP and Tribal resources and potential for problems with individuals that are dissatisfied would be greater under this alternative than with Alternative 1 where WS with MFWP or Tribe would work together on GWDM assistance. The impact of these changes on the wolf population could be that authorized take of wolves for GWDM might be lower than under Alternative 1, but frustration and illegal take may increase (Allen et al. 1996) which would, in actuality, lead to a higher take of wolves under this Alternative.

Use of techniques like nonlethal projectiles, aversive conditioning (*e.g.*, dog training collars), and disruptive stimuli (remote activated frightening devices, fladry and guarding-and-hazing) by WS would be slightly higher under this Alternative than Alternative 1 because WS would be required to use these techniques in situations where a lethal method might be the preferred technique for resolving a damage problem. However, the increase would likely be minor, because situations warranting the use of lethal methods would be referred to MFWP and the Tribes. Any activity that involves the capture and handling of wolves or the use of nonlethal projectiles involves a risk of unintentional death of the wolf.

Cumulative Impacts

Alternative 2 could possibly result in a lower cumulative impact on Montana's wolf population than Alternative 1. However, wolves can be killed by livestock producers when livestock are attacked or harassed and MFWP would exercise the option of lethally removing wolves (without WS assistance) (the 2003 GW Plan) and ,depending on the harvest quotas set by the MFWP Commission, the cumulative impacts on Montana's wolf population could be similar, more, or less to what would occur under Alternative 1, dependent on MFWP's and Tribal response to depredations, private landowner efforts and the methods they use, and the potential for illegal use of methods caused from frustration of resource owners.

In summary, under this alternative, WS would not have any intentional lethal removal of wolves, but could have the unlikely unintentional take of a few wolves during capture for monitoring purposes or from the use of aversive conditioning methods. Depending upon the experience and training of the individuals conducting lethal GWDM for MFWP and Tribes, the level of intentional take of wolves could be similar to Alternative 1, lower if they are ineffective with the methods used, or higher from capturing more wolves than necessary to stop depredations and the potential illegal use of chemicals. Take could be slightly lower if less experienced individuals have more difficulty capturing wolves than WS and MFWP. Take could be slightly higher if the individuals are less selective in their trapping efforts or illegal methods are used which might result in greater take of wolves to resolve a damage problem. If MFWP has to move staff from wolf research to GWDM, the wolf population will not benefit from any potential advances in wolf management that could have resulted from the research program. It is anticipated that illegal take would be much higher under this Alternative than under Alternative 1. The level of illegal take is difficult to predict because of the remote rural nature of much of the area used by wolves in Montana. However, risk of illegal action would be lower for this Alternative than for Alternative 3 where strain on MFWP's resources is likely to be the greatest.

4.3.2.2 Effects on Nontarget Species Populations Including State and Federally Listed T&E Species. Under Alternative 2, WS would not have an impact on any nontarget species population, including T&E species because WS would only use nonlethal methods. However, it is possible that some nonlethal methods could incidentally kill a wolf.

Alternative 2 would not allow WS to conduct direct operational GWDM. Therefore, WS would not have any direct impact on nontarget or T&E species. Under this alternative, MFWP and Tribes would likely provide some level of professional assistance with GWDM. However, private GWDM efforts would likely increase in proportion to any reduced effort in GWDM by WS, MFWP, and Tribes. Although technical support from WS might lead to more selective use of GWDM methods by private parties than that which would occur under Alternative 3, private efforts to reduce or prevent depredations could result in less experienced persons implementing GWDM methods leading to greater take of nontarget wildlife and T&E species. This alternative would have the potential for increased adverse impacts resulting from WS not providing quality

GWDM and the compensatory actions of private individuals. Trap and cable restraint selection, settings (stops on cable restraints, pan-tension devices, etc.), placement, and lures that are designed to minimize risks to nontarget species may not be used by private individuals and this would likely result in higher take of nontarget species. Even despite these precautions, traps and cable restraints may occasionally capture nontarget species (Table 4-4). However, measures to prevent injuries and keep wolves alive would also reduce risks to nontarget species. These risks are very low and take is anticipated to be well below the sustainable harvest level for nontarget species populations with the exception of T&E species. Presumably, many service recipients would become frustrated with WS's failure to resolve their wildlife damage, and would go elsewhere for assistance. Higher variability in the level and scope of GWDM activities could occur without a full IWDM program, and this could have a greater negative effect on some local wildlife species (including T&E species). It is expected that many nontarget species, including T&E, and sensitive species would be taken under this Alternative because private individuals would not be required to follow WS's self-imposed SOPs as described in Section 3.6. Thus, it is expected that nontarget take would be much higher under this Alternative than under Alternative 1.

4.3.2.3 Effects on Public and Pet Health and Safety. Under Alternative 2 there would be no lethal GWDM activities conducted by WS so the already low level of potential risk to the public and pets associated with any WS lethal control efforts would be nearly eliminated. WS could be using traps, and cable restraints to capture wolves for population monitoring and other nonlethal techniques which require handling of wolves (*e.g*., radio tracking collar). Measures to reduce risks to nontarget species are included in the SOPs described in Section 3.6. In addition, all actions would be conducted in accordance with the Montana's trapping rules and regulations. Overall risks to nontarget species from WS use of nonlethal GWDM actions would be similar to or slightly lower than Alternative 1.

Although risks of adverse impacts from WS use of lethal GWDM would be lower under this Alternative, MFWP, their designated agents, and individuals with wolf depredation permits could implement lethal wolf management and take the same precautions as WS. The same may not be necessarily true for private individuals working under permits issued for GWDM on their property. Consequently, cumulative risks to public and pet health and safety would likely be similar to or slightly greater than with Alternative 1 and similar to Alternative 3.

As discussed above, nonlethal methods are not always effective in reducing problems. The overall efficacy of this alternative will depend on whether or not MFWP is able to establish an equally prompt and effective lethal GWDM program in the absence of WS assistance with lethal GWDM. If there are perceived difficulties with the program, frustrated individuals may attempt to solve wolf damage problems through illegal shooting, trapping, snaring, or poisoning[53]. As a result of these illegal actions, there could be increased risks to public and pet safety from improper efforts to resolve problems or perceived problems with wolves. Illegal poisons, especially, have high risks of severe adverse impacts on public and pet health and safety, as well as on nontarget wildlife species. Illegal toxicants represent one of the cheapest forms of predator removal, but it also presents the greatest environmental risks (Schueler 1993, Allen et al. 1996, USDA 1997). Under this alternative, risks to T&E and other nontarget species from illegal actions would probably be greater than Alternatives 1 and similar to Alternative 3.

[53] In 2006 a rural resident from central Idaho pled guilty to illegally placing poisoned meatballs on Salmon-Challis National Forest lands in an effort to kill wolves. Three pet dogs were poisoned as a result of his actions.

4.3.2.4 Humaneness and Animal Welfare Aspects of the Methods to Be Used. Because WS would not be conducting any lethal GWDM under Alternative 2, some people would consider WS' actions under this Alternative more humane than under Alternative 1. However, trap and cable restraint selection, settings (stops on cable restraints, pan-tension devices, etc.), placement and lures are designed to maximize humaneness while maintaining method effectiveness. Some individuals would prefer that cage traps be used to capture wolves and would perceive this method as being more humane than traps and cable restraints. Unfortunately, the use of cage traps to capture wolves is usually impractical and ineffective because it is extremely difficult to get a cage trap large enough for an adult wolf into remote locations, and because it is rare to capture an adult wolf in a cage trap. Additionally, cage traps can injure trapped animals as they try to escape. Although WS would be limited to using only nonlethal methods, a variety of lethal methods would most likely be employed by livestock owners and their agents to address wolf depredations. MFWP could implement lethal control methods or authorize members of the public to take wolves to address depredation issues. In addition, if MFWP personnel are moved from wolf research to GWDM, it will also decrease the amount of testing and development of new, more humane management methods. If the entities conducting the lethal wolf control lack the training, experience, and resources of WS personnel, there may be a greater risk of unnecessary injury or pain from less than optimal use of some techniques. It is conceivable, and perhaps even likely, that individuals experiencing wolf damage who could not rely on WS to remove wolves, may attempt to remove wolves through illegal means such as the use of a readily available variety of agricultural pesticides or through illegal trapping methods. Depending on the illegal toxicant or trapping methods used, death of an individual might occur over a protracted period of time as compared to other methods such as shooting (Schueler 1993, Allen et al. 1996, USDA 1997).

4.3.3 Alternative 3 - No WS GWDM in Montana

4.3.3.1 Effects on the Wolf Population in Montana. This Alternative would result in similar results as under Alternative 2. Under this Alternative, WS would not implement any gray wolf management and, thus, would have no impact on the gray wolf population. The difference between Alternatives 2 and 3 is that WS would not implement a nonlethal program using nonlethal projectiles or assist with wolf monitoring and, therefore, would have no incidental take of wolves, though this would be relatively few, if any. In addition, it is likely that a few wolves would be taken lethally by people under this Alternative that may have received assistance from WS with effective nonlethal methods under Alternatives 1 and 2.

Non-WS take would likely remain similar to that which would occur under Alternative 2. Under this alternative, MFWP and Tribes would issue landowners trapping and shooting permits and MFWP could implement their own GWDM program within the constraints of the GW Plans and laws and regulations. This alternative would place the greatest strain on MFWP and Tribal personnel and resources because there would be no assistance from WS. Limits on MFWP and Tribal resources under this alternative would likely result in increased use of landowner permits and the need to find other "agents" that can assist landowners with wolf problems. It may be difficult to find and retain individuals with comparable training and experience in GWDM as WS personnel.

This alternative is expected to result in a reduction in the efficacy and efficiency of wolf management efforts; and it is reasonable to conclude will also result in a reduction in tolerance of wolves by the landowners and an increase in illegal take. Frustration with wolf management and levels of wolf damage may be highest for this alternative because of what individuals may perceive as unnecessary obstacles to GWDM assistance and the inability of WS to respond to problems caused by wolves. In addition, illegal lethal control actions by private individuals are

less likely to be very specific or humane, and could potentially have more adverse impacts on the wolf population than focused lethal actions by trained, authorized professionals. Any illegal lethal control by individuals is also less likely to be effective in reducing depredation events, as it would be less likely to target the specific depredating animals.

Cumulative Impacts

Authorized take under this Alternative would be similar to Alternative 2 and similar to Alternative 1, but could be higher or lower depending on a variety of factors such as the success of targeting depredating wolves by private individuals, the number of wolves taken to resolve problems, and the level of assistance given by MFWP and the Tribes. As under all alternatives, wolves can be killed by livestock producers when livestock are attacked or harassed and MFWP and the Tribes are expected to exercise their authority to lethally remove wolves. Thus, since WS would take possibly a fewer wolves, it is possible that a few less wolves may be taken. However, as discussed, the take of wolves will not impact their population.

If MFWP wolf program personnel are forced to spend more time on GWDM efforts, work on wolf population monitoring programs and other natural resource management programs would suffer. Nonlethal and lethal control work by MFWP and Tribes without the aid of WS is likely to be time consuming and, therefore, may reduce the flexibility of Montana's wolf management. Thus, the ability of MFWP to determine wolf population size and distribution, changes in population growth rates, changes in mortality factors, and other characteristics of the wolf population could be reduced. If MFWP does not maintain adequate surveys of the wolf population, proper management of wolves would be more difficult and public confidence in wolf management could decline. Additionally, WS has assisted various research organizations, international countries, State and Federal agencies with collecting biological samples from wolves captured at damage sites for numerous research efforts to aid wolf conservation. If WS selects this alternative, it is unlikely that an equivalent level of research assistance would be available.

4.3.3.2 Effects on Nontarget Species Populations Including State and Federally Listed T&E Species. Under this alternative, neither WS nor any other federal agency would provide assistance with GWDM and, therefore, would not have an effect on nontarget or T&E species. USDA (1997) demonstrated that under the No Federal Program Alternative, more nontarget animals would be affected. For example, most people that take bears cannot knock them down with a tranquilizer to release them and, therefore, will kill them rather than release them.

MFWP and Tribes would probably still provide some level of professional GWDM assistance, but without federal supervision, and would continue to take minimal numbers of nontargets, proportionate to the decrease in state and federal efforts. Private efforts to reduce or prevent depredations would increase the most under this alternative. This would result in less experienced persons implementing GWDM methods leading to a greater take of nontarget wildlife (potentially including T&E species) than under the Current Program Alternative or Alternative 2. Private landowners would increase their efforts and public land grazers would also increase their efforts. Private individuals would use GWDM methods where WS personnel may not because WS personnel follow WS SOPs such as WS's self-imposed restrictions (i.e., not setting traps closer than 30 feet to livestock carcasses to avoid capturing scavenging birds or using pan-tension devices to exclude smaller animals). Therefore, hazards to raptors, including Bald and Golden Eagles, and other nontargets could be greater under this Alternative. Measures to avoid T&E impacts were described in Section 3.6. Whereas WS would adhere to these measures, private citizens might or might not be required to act in accordance with them. This

could lead to a much greater impact on T&E species than under Alternative 1. It is anticipated that private efforts to take target predators could result in potential adverse impacts for 22 T&E and sensitive species (Tables 2-1 and 2-2). This potential is much higher than that under the Proposed Action. As described in Section 2.3.3, the hypothetical use of illegal GWDM methods such as chemical toxicants could impact nontarget species populations, including T&E species. It is, therefore, highly likely that many more impacts to nontarget species would occur under this alternative than the current program.

4.3.3.3 Effects on Public and Pet Health and Safety. We anticipate that MFWP would place the highest staff priority on responding to issues of risk to human health and safety and would not delegate response to these risks to personnel who lack the training and experience to effectively address these concerns. Consequently, risks to human health and safety from wolves would be similar under this Alternative as under the other Alternatives.

It is reasonable to assume that whatever GWDM program MFWP and Tribes implemented in the absence of WS, would result in an increase in the number of individuals attempting to resolve wolf damage problems who lack the training and experience of MFWP, the Tribes, and WS personnel. There would likely be more trapping and shooting permits issued to landowners who have experienced wolf depredation. Less experienced individuals may require more time to resolve a damage problem which would result in an increase in the amount of time that traps and snares are in use. The overall result of these changes could be an increase in the number of pets that are captured in equipment placed for wolves. Private individuals who would be authorized to conduct GWDM through shooting and trapping permits are not required to follow policies that WS personnel are required to follow which may also lead to increases in risks to pets and human safety. The use of illegal methods as described in Section 2.3.3, especially toxicants, is expected to be greatest under this Alternative and this would have unknown consequences on people and pets. Several pets have been taken by people trying to resolve wolf problems on their own (Stahl 2004, Smith 2012).

4.3.3.4 Humaneness and Animal Welfare Aspects of the Methods to Be Used. This Alternative might be considered more humane by many people who are opposed to lethal methods employed by WS since WS would no longer use such methods, but lethal control of wolves will continue regardless of whether WS is involved (K. McDonald, MFWP, Wildlife Bureau Chief, pers. comm. 2012 and the GW Plans). MFWP and Tribes would likely use or issue permits to use traps and snares to capture and euthanize depredating wolves and to radio collar wolves for population monitoring and wolf damage management techniques that require a radio-collar on one or more wolves. There would, however, likely be a greater dependence on private landowners who would be issued trapping and shooting permits. These individuals would likely be less trained and experienced than MFWP or WS personnel, and might not employ the most appropriate tools and methods and not use them in the most humane manner (e.g., leave traps out for several days to over a week between checks). Additionally, private individuals are not likely to be certified to use tranquilizers which helps make many situations more humane.

Out of frustration, some property owners may take illegal action against localized populations of wolves where continued damage occurs in the absence of a quick and effective GWDM program (Treves and Naughton-Treves 2005). Some illegal methods, like poisons such as antifreeze, may be less humane than methods used by experienced agency personnel and used in attempts to possibly take wolves, but wind up killing unintended nontargets (Stahl 2004, Smith 2012). Animal welfare aspects in terms of pain and suffering of some livestock and pets would likely be worse under this Alternative because overall efficacy in addressing damage problems would likely be lower than with Alternative 1.

4.4 SUMMARY OF IMPACTS

Table 4-4 briefly summarizes the potential impacts of each Alternative analyzed in detail against each of the issues that were analyzed in detail. This EA recognizes that the total annual removal of individual animals from wildlife populations by all causes is the cumulative mortality. The anticipated impacts on Montana's wolf population from the various Alternatives would differ to some degree depending on the alternative selected and the management strategy used by MFWP. None of the three Alternatives would be expected to adversely affect Montana's wolf population, regardless of MFWP management strategies because the 2003 GW Plan would ensure a viable, sustainable population. WS lethal wolf take would be conducted to reduce specific depredation problems, as authorized by MFWP, and would not be used as a means to reduce the statewide or regional wolf population (K. McDonald, MFWP, Wildlife Bureau Chief, pers. comm. 2012). People opposed to lethal wolf control may be opposed to implementation of Alternative 1, but as discussed and analyzed in the EA, lethal GWDM would occur regardless of whether WS is involved or not. Depending on the alternative selected, WS actions would only be conducted in cooperation MFWP and as authorized by MFWP through the 2003 GW Plan and an MOU between MFWP and WS.

Table 4-4. Summary of impacts under the three alternatives in regards to the 4 alternatives.

Issue	Alternative 1: Continue with Current Adaptive Integrated GWDM in Cooperation with MFWP	Alternative 2: Nonlethal GWDM Only	Alternative 3: NO GWDM by WS in Montana
Effects on Montana's wolf population	Low, as WS actions would be directed by MFWP and under the guidance provided in the GW Plans. The 2003 GW Plan calls for the maintenance of at least 15 breeding pairs.	WS impacts would be minimal. However, any control actions would still be directed by MFWP oversight. And likely similar to the take of wolves under Alternative 1.	WS impacts would be minimal. Impacts by MFWP, Tribes, and private entities would likely be similar to the other 2 alternatives.
Effects on nontarget species populations, including State and federally listed T&E species	WS takes few nontarget species in GWDM and only lethally took 2 from FY07 to FY11. WS anticipates that this will not increase significantly.	WS would have minimal potential to affect nontarget species under this alternative. MFWP and Tribes would be expected to take similar numbers of nontarget species as WS. However, it is anticipated that private entities would have much higher take of nontargets, both with legal methods and illegal methods. Thus, nontarget take is expected to be greater under Alternative 2 than Alternative 1.	Similar as under Alternative 2 except that WS would pose no risk to nontargets under this alternative.
Effects on public and pet health and safety	Low risk to the public and peoples' pets.	Probably greater risk to public and pets than under Alternative 1. Less experienced trappers may not be as effective in their efforts.	Similar as under Alternative 2.
Humaneness and animal welfare aspects of the methods to be used	Management methods are employed as humanely as practical and in compliance with MFWP policy. There would continue to be trade-offs between the welfare of wolves and the welfare of domestic animals attacked by wolves.	Possible increased likelihood that frustrated private individuals would employ less humane methods, such as illegal toxicants or trapping methods. Less experienced trappers may not be as humane in their efforts.	Similar as under Alternative 2.

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5.2 LITERATURE CITED

Acorn, R. C. and M. J. Dorrance. 1990. Methods of investigating predation of livestock. Alb. Agric., Food and Rural Dev., Edmonton, Alb., Can.

Adams, L. G., R. O. Stephenson, B. W. Dale, R. T. Ahgook, and D. J. Demma. 2008. Population dynamics and harvest characteristics of wolves in the central Brooks Range, Alaska. Wildl. Mono. 170.

Allen, G. T., J. K. Veatch, R. K. Stroud, C. G. Vendel, R. H. Poppenga, L. Thompson, J. Shafer, and W. E. Braselton. 1996. Winter poisoning of coyotes and raptors with Furadan-laced carcass baits. J. Wildl. Dis. 32:385-389.

American Veterinary Medical Association (AVMA). 1987. Panel Report on the Colloquium on Recognition and Alleviation of Animal Pain and Distress. J. Amer. Veterinary Med. Assoc. 191:1186-1189.

_____ AVMA. 2001. 2000 Report of the AVMA panel of Euthanasia. J. Amer. Veterinary Med. Assoc. 218: 669-696.

_____ AVMA. 2007. AVMA guidelines on euthanasia (formerly report of the AVMA panel on euthanasia), June 2007. J. Amer. Veterinary Med. Assoc., Schamburg, Ill. 36 pp.

Andelt, W. F. 1987. Coyote predation. Pp. 128 – 140. *In* M. Novak, J. A Baker, M. E. Obbard, and B. Malloch, eds. Wild Furbearer Management and Conservation in North America. Ontario Trappers Assoc., North Bay, Ont.

Atwood, T. C., E. M. Gese, and K. E. Kunkel. 2007. Comparative patterns of predation by cougars and recolonizing wolves in Montana's Madison Range. J. Wildl. Manage. 71: 1098-1106.

Backus, P. 2010. Sportsmen's groups want wolves killed to protect Bitterroot elk. The Missoulian Aug31. Website @ http://missoulian.com/news/local/article_da343228-b4ba-11df-8c52-001cc4c03286.html. *Last visited 10/5/2012.*

Baker, B. W. and E. F. Hill. 2003. Beaver: *Castor canadensis*. Pp. 288-310. *In* G. A. Feldhamer, B. C. Thompson, and J. A. Chapman, eds. Wild Mammals of North America: Biology, Management, and Conservation. John Hopkins Univ. Press, Baltimore, Md.

Ballard, W. B., L. A. Ayres, P. R. Krausman, D .J. Reed, and S. G. Fancy. 1997. Ecology of wolves in relation to a migratory caribou herd in northwest Alaska. Wildl. Monogr. 135:1-47.

Ballard, W. B., L. N. Carbyn, and D. W. Smith. 2003. Wolf interactions with non-prey. Pp. 259-271. *In* L. D. Mech and L. Boitani, eds. Wolves: Behavior, Ecology, and Conservation. Univ. Chicago Press, Chicago, Ill.

Ballard, W. B., J. S. Whitman, and C. L. Gardner. 1987. Ecology of an exploited wolf population in south-central Alaska. Wildl. Monogr. 98:1-54.

Bangs, E. E., J. A. Fontaine, M. D. Jimenez, T. J. Meier, E. H. Bradley, C. C. Niemeyer, D. W. Smith, C. M. Mack, V Asher, and J. K. Oakleaf. 2005. Managing wolf/human conflict in the north-western United States. Pp. 340-356. *In* R. Woodroffe, S. Thirgood, and A. Rabinowitz, eds. People and Wildlife: Coexistence or Conflict? Cambridge Univ. Press, Cambridge, England.

Bangs, E., J. Fontaine, T. Meier, C. Niemeyer, M. Jimenez, D. Smith, C. Mack, V. Asher, L. Handegard, M. Collinge, R. Krischke, C. Sime, S. Nadeau, and D. Moody. 2004. Restoration and conflict management of the gray wolf in Montana, Idaho, and Wyoming. Trans. N. Amer. Wildl. and Nat. Resour. Conf. 69: 89-105.

Bangs, E. E., S. H. Fritts, J. A. Fontaine, D. W. Smith, K. M. Murphy, C. M. Mack, and C. C. Niemeyer. 1998. Status of gray wolf restoration in Montana, Idaho, and Wyoming. Wildl. Soc. Bull. 26: 785-798.

Bangs, E. E., S. H. Fritts, D. R. Harms, J. A. Fontaine, M. D. Jimenez, W. G. Brewster, and C. C. Niemeyer. 1995. Control of endangered gray wolves in Montana. Pp. 127-134. *In* L. N. Carbyn, S. H. Fritts, and D. R. Seip, eds. Ecology and Conservation of Wolves in a Changing World. , Alb. Can.: Can. Circumpolar Inst.

Bangs, E., M. Jimenez, C. Niemeyer, J. Fontaine, C. Sime, S. Nadeau, and C. Mack. 2009. The art of wolf restoration in the northwestern United States: Where do we go now? Pp. 95-114. *In* M. Musiano, L. Boitani, and P. Paquet, eds. A New Era for Wolves and People: Wolf Recovery, Human Attitudes, and Policy. Univ. Calgary Press. Alb., Can.

Bangs, E. E. and J. Shivik. 2001. Managing wolf conflict with livestock in the northwestern United States. Carnivore Damage Prevention News 3: 2-5.

Berryman, J. H. 1991. Biodiversity: A word of caution. Southeast Assoc. Fish and Wildl. Agencies 45:13-18.

Beschta, R.L. 2003. Cottonwoods, elk, and wolves in the Lamar Valley of Yellowstone National Park. Ecol. Applic. 13:1295-1309.

Beyer, H. 2006. Wolves, elk, and willow on Yellowstone's northern range. Univ. Alb., Edmonton, Canada.

Bishop, R. C. 1987. Economic values defined. Pp. 24-33. *In* D. J. Decker and G. R. Goff, eds. Valuing Wildlife: Economic and Social Perspectives. Westview Press, Boulder, CO. 424 pp.

Bjorge, R. R. and J. R. Gunson. 1985. Evaluation of wolf control to reduce cattle predation in Alberta. J. Range Manage. 38: 483-487.

Blackfeet Nation (BN). 2008. Wolf management plan. BN Tribal Council, Adopted June. 10 pp.

Blejwas, K. M., B. N. Sacks, M. M. Jaeger, and D. R. McCullough. 2002. The effectiveness of selective removal of breeding coyotes in reducing sheep predation. J. Wildl. Manage. 66:451-462.

Boertje, R. D. and R. O. Stephenson. 1992. Effects of ungulate availability on wolf reproduction potential in Alaska. Can. J. Zool. 70: 441-443.

Boitani, L. 2003. Wolf conservation and recovery. Pp. 317-340. *In* L. D. Mech and L. Boitani, eds. Wolves: Behavior, Ecology, and Conservation. Univ. Chicago Press, Chicago, Ill.

Boyd, D. K. and M. D. Jimenez. 1994. Successful rearing of young by wild wolves without mates. J. Mamm. 75:14-17.

Boyd, D. K. and D. H. Pletscher. 1999. Characteristics of dispersal in a colonizing wolf population in the central Rocky Mountains. J. Wildl. Manage. 63: 1094-1108.

Boyd, D. K., R. R. Ream, D. H. Pletscher, and M. W. Fairchild. 1994. Prey taken by colonizing wolves and hunters in the Glacier National Park Area. J. Wildl. Manage. 58: 289-295.

Boyd, D. K., P. C. Paquet, S. Donelson, R. R. Ream, D. H. Pletscher, and C. C. White. 1995. Transboundary movements of a colonizing wolf population in the Rocky Mountains. Pp. 135-140. *In* L. N. Carbyn, S. H. Fritts, and D. R. Seip, eds. Ecology and Conservation of Wolves in a Changing World. Can. Circumpolar Inst., Occas. Publ. No. 35. Edmonton, Alb., Can.

Bradley, E. H. 2004. An evaluation of wolf-livestock conflicts and management in the northwestern United States. Thesis, Univ. Mont., Missoula.

Bradley, E. H. and D. H. Pletscher. 2005. Assessing factors related to wolf depredation of cattle in fenced pastures in Montana and Idaho. Wildl. Soc. Bull. 33:1256-1265.

Bradley, E. H., D. H. Pletscher, E. E. Bangs, K. E. Kunkel, D. W. Smith, C. M. Mack, T.J. Meier, J. A. Fontaine, C. C. Niemeyer, and M. D. Jimenez. 2005. Evaluating wolf translocation as a nonlethal method to reduce livestock conflicts in the northwestern United States. Conserv. Biol. 19:1498-1508.

Brainerd, S. M., H. Andre´n, E. E. Bangs, E. Bradley, J. A. Fontaine, W. Hall, Y. Iliopulos, M. D. Jimenez, E. A. Jozwiak, O. Liberg, C. M. Mack, T. J. Meier, C. C. Niemeyer, H. C. Pedersen, H. K. Sand, R. N. Schultz, D. W. Smith, P. Wabakken, and A. P. Wydeven. 2008. The effects of breeder loss on wolves. J. Wildl. Manage. 72: 89-98.

Breck, S. W., R. Williamson, C. Niemeyer, and J. A. Shivik. 2002. Non-lethal radio activated guard for deterring wolf predation in Idaho: summary and call for research. Proc. Vertebr. Pest Conf. 20: 223-226.

Bromley, C. and E. M. Gese. 2001. Effect of sterilization on territory fidelity and maintenance, pair bonds, and survival rates of free-ranging coyotes. Can. J. Zool. 79:386-392.

Brown, J. 2006. Eco-logical: An ecosystem approach to developing infrastructure Projects. U.S. Dept. of Transportation. Final Report 2002-2006. National Techn. Infor. Serv., Springfield, Va.

Carroll, C., M. K. Phillips, C. A. Lopez-Gonzalez, and N. H. Schumaker. 2006. Defining recovery goals and strategies for endangered species: the wolf as a case study. BioScience 56: 25-37.

California Department of Fish and Game. 1991. Final Environmental Document - Bear Hunting Sections 265, 365, 366, 367, 367.5. Title 14 Calif. Code of Regs. Cal. Fish and Game, State of Calif., April 25, 1991. 13 pp.

California Department of Fish and Game. 2004. Draft environmental document - Bear hunting. Sections 265, 365, 366, 367, 367.5, 401, 708 Title 14 California Code of Regulations, January 30, 2004. Calif. Dept. Fish and Game, Sacto., Calif.

Cochrane, J. F., R. G. Haight, and A. M. Starfield. 2003. Modeling for endangered-species recovery: gray wolves in the Western Great Lakes Region. Pp. 23-45. *In* Dale, V. H., ed. Ecological Modeling for ResourceManagement. Springer-Verlag, NY, NY.

Collinge, M. 2008. Relative risks of predation on livestock posed by individual wolves, black bears, mountain lions, and coyotes in Idaho. Proc. Vertebr. Pest Conf. 23: 129-133.

Confederated Salish and Kootenai Tribes (CSKT). 2009. Northern gray wolf management plan for the Flathead Indian Reservation. CSKT, Tribal Wildl. Manage. Prog., Pablo, Mont. July 4. 17 pp.

Coppinger, R. and L. Coppinger. 1996. Interactions between livestock guarding dogs and wolves. Pp. 523-526. *In* L. N. Carbyn, S. H. Fritts, D. R. Seip, eds. Ecology and Conservation of Wolves in a Changing World. Can. Circumpolar Inst., Occas. Publ. No. 35. 642 pp.

Council for Environmental Quality (CEQ). 1981. Forty most asked questions concerning CEQ's National Environmental Policy Act regulations. (40 CFR 1500-1508). 46 FR 18026-18038.

Craighead, F. C., Jr., and J. J. Craighead, J. J. 1972*a*. Data on grizzly bear denning activities and behavior obtained by using wildlife telemetry. Pp. 84-106. *In* S. Herrero, ed. Bears-Their Biology and Management. Morges, IUCN Publ. New Series 23.

Craighead, F. C., Jr., and J. J. Craighead, J. J. 1972*b* . Grizzly bear prehibernation and denning activities as determined by radio tracking. Wildl. Monogr. 32. 35pp.

Crabtree, R. L, and J. W. Sheldon. 1999. Coyotes and canid coexistence in Yellowstone. Pp. 127-163. *In* T. W. Clark, A. P. Culee, S. C. Minta, and P. M. Karieva, eds. Carnivores in Ecosystems, the Yellowstone Experience. Yale Univ. Press, New Haven, Conn.

Creel, S. and J. Winnie, Jr. 2005. Response of elk herd size to fine-scale spatial and temporal variation in the risk of predation by wolves. Animal Beh. 69:1181-1189.

Creel, S., J. A. Winnie, Jr., B. Maxwell, K.L. Hamlin, and M. Creel. 2005. Elk alter habitat selection as an antipredator response to wolves. Ecol. 86:3387-3397.

Decker, D. J. and G. R. Goff. 1987. Valuing Wildlife: Economic and Social Perspectives. Westview Press. Boulder, CO. 424 pp.

Decker, D. J. and K. G. Purdy. 1988. Toward a concept of wildlife acceptance in wildlife management. Wildl. Soc. Bull. 16:53-57.

Decker, D. J. and L. C. Chase. 1997. Human dimension of living with wildlife - a management challenge for the 21st century. Wildl. Soc. Bull. 16:53-57.

Defenders of Wildlife. 2012. Wolves and their prey. Defenders of Wildl, Wash., D.C. Website @ https://www.defenders.org/publications/wolves_and_their_prey.pdf. *Last visited 10/5/2012*.

Denver News. 2011. Wolf that trekked 3,0000 miles killed by illegal poison. 7 News, A. Gaithright content producer. @ http://www.thedenverchannel.com/news/26451898/detail.html. *Last visited 10/2/2012.*

Dorrance, M. J. and J. Bourne. 1980. An evaluation of anti-coyote electric fencing. J. Range Manage. 33:385-387.

Dubey, J. P. 2003. Review of *Neospora caninum* and neosporosis in animals. Korean J. Parasitol. 41: 1-16.

Duffield, J., C. Neher, and D. Patterson. 2006. Wolves and people in Yellowstone: Impacts on the regional economy. , Univ. Mont., Missoula, MT: 1-67.

Eccleston, C. 1995. Determining when an analysis contains sufficient detail to provide adequate NEPA coverage. Fed. Facilities Environ. J., Summer:37-50.

Foreyt, W. J., M. L. Drew, M. Atkinson, and D. McCauley. 2009. *Echinococcus granulosus* in gray wolves and ungulates in Idaho and Montana, USA. J. Wildl. Diseases 45: 1208-1212.

Fortin, D., H. L. Beyer, M. S. Boyce, D. W. Smith, T. Duchesne, and J. S. Mao. 2005. Wolves influence elk movements: Behavior shapes a trophic cascade in Yellowstone National Park. Ecol. 86: 1320-1330.

Frame, P. F., H. D. Cluff, and D. S. Hik. 2007. Response of wolves to experimental disturbance at home sites. J. Wildl. Manage. 71: 316-320.

Fritts, S. H., and L. N. Carbyn. 1995. Population viability, nature reserves, and the outlook for gray wolf conservation in North America. Restoration Ecol. 3: 26-38.

Fritts, S. H. and W. J. Paul. 1989. Interactions of wolves and dogs in Minnesota. Wildl. Soc. Bull. 17:121-123.

Fritts, S. H., W.J. Paul, and L. D. Mech. 1984. Movements of translocated wolves in Minnesota. J. Wildl. Manage. 48:709-721.

Fritts, S. H., W. J. Paul, and L. D. Mech. 1985. Can relocated wolves survive? Wildl. Soc. Bull. 13:459-463.

Fritts, S. H., W. J. Paul, L. D. Mech, and D. P. Scott. 1992. Trends and management of wolf-livestock conflicts in Minnesota. USFWS Resource. Publ. 181, Wash., D.C. 27 pp.

Fritts, S. H., R. O. Stephenson, R. D. Hayes, and L. Boitani. 2003. Wolves and humans. Pp. 289-316. *In* L. D. Mech and L. Boitani, eds. Wolves: Behavior, Ecology, and Conservation. Univ. Chicago Press, Chicago, Ill.

Fuller, T. K. 1989. Population dynamics of wolves in North-Central Minnesota. Wildl. Monogr. 105:1-41.

Fuller, T. K., W. E. Berg, G. L. Radde, M. S. Lenarz, and G. B. Joselyn. 1992. A history and current estimate of wolf distribution and numbers in Minnesota. Wildl. Soc. Bull. 20:42-55.

Fuller, J. and R. A. Garrott. 2004. Lower Madison Valley Wolf-Ungulate Research Project. 2003-2004 Ann. Rept. Mont. St. Univ.

Fuller, T. K., L. D. Mech, and J. F. Cochrane. 2003. Wolf population dynamics. Pp. 161-191. *In* L. D. Mech and L. Boitani, eds. Wolves: Behavior, Ecology, and Conservation. Univ. Chicago Press, Chicago, Ill.

Garrott, R. A., J. A. Gude, E. J. Bergman, C. Gower, P. J. White, and K. L. Hamlin. 2005. Generalizing wolf effects across the greater Yellowstone area: a cautionary note. Wildl. Soc. Bull. 33:1245-1255.

Garrott, R. A., P. J. White, and C. A. Vanderbilt-White. 1993. Overabundance: An issue for conservation biologists? Conserv. Biol. 7: 946-949.

Gasaway, W. C., R. O. Stephenson, J. L. David, P. K. Shepherd, and O. E. Burns. 1983. Interrelationships of wolves, prey, and man in interior Alaska. Wildl. Mono. 84:1-50.

Geffen, E., M.J. Anderson, and R.K. Wayne. 2004. Climate and habitat barriers to dispersal in the highly mobile gray wolf. Molecular Ecol. 13:2481-2490.

Gillespie, J. H. and J. F. Timoney. 1981. The *Paramyxoviridae*: canine distemper. Pp. 726-728. *In* W. A. Hagan and D. W. Bruner, eds. Infectious Diseases of Domestic Animals, with Reference to Etiology, Pathogenicity, Immunity, Epidemiology, Diagnosis and Biologic Therapy. Cornell Univ. Press, Ithaca, NY.

Gondim, L. F., M. M. McAllister, W. C. Pitt, and D. E. Zemlicka. 2004*a*. Coyotes (*Canis latrans*) are definitive hosts of *Neospora caninum*. International J. Parasitol. 34:159-161.

Gondim, L. F., M. M. McAllister, N. E. Mateus-Pinilla, W. C. Pitt, L. D. Mech, and M. E. Nelson. 2004*b*. Transmission of *Neospora caninum* between wild and domestic animals. J. Parasitol. 90:1361-1365.

Grigg, J. and R. A. Garrott. 2005. Lower Madison Valley Wolf-Ungulate Research Project, 2004-2005 annual report. Mont. St. Univ., Missoula.

Gude, J. A. and R. A. Garrott. 2003. Lower Madison Valley Wolf-Ungulate Research Project, 2002-2003 annual report. Mont. St. Univ., Missoula.

Gude, J. A., B. Garrott, J.J. Borkowski, F. King. 2006. Prey risk allocation in a grazing ecosystem. Ecol. Applic. 16: 285-298.

Gustavson, C. R. and L.K. Nicolaus. 1987. Taste aversion conditioning in wolves, coyotes, and other canids: retrospect and prospect. Pp. 169-203. *In* H. Frank, ed. Man and Wolf: Advances, Issues, and Problems in Captive Wolf Research. W. Junk, Boston, Mass.

Haber, G. C. 1996. Biological, conservation and ethical implications of exploiting and controlling wolves. Cons. Biol. 10:1068-1081.

Haight, R. G. and L. D. Mech. 1997. Computer simulation of vasectomy for wolf control. J. Wildl. Manage. 61:1023-1031.

Haight, R. G., L. E. Travis, K. Nimerfro, and L.D. Mech. 2002. Computer simulation of wolf removal strategies for animal damage control. Wildl. Soc. Bull. 30:844-852.

Hall C.A., M.P. Reichel, J.T. Ellis 2005 *Neospora* abortions in dairy cattle: diagnosis, mode of transmission and control. Veterinary Parasitol., 128 (2005):231–241

Hamlin, K. L. 2006. Monitoring and assessment of wolf-ungulate interactions and trends within the greater Yellowstone ecosystem and associated areas of southwestern Montana. MFWP, Federal Aid in Wildl. Restoration Proj., Helena, Mont.

Hamlin, K. L. and J. A. Cunningham. 2009. Monitoring and assessment of wolf-ungulate interactions and population trends within the Greater Yellowstone Area, southwestern Montana, and Montana statewide: Final Report. MFWP, Wildlife Division, Helena, Mont.

Hamlin, K. L.; R. A. Garrott, P. J. White, and J. A. Cunningham. 2008. Contrasting wolf-ungulate interactions in the Greater Yellowstone Ecosystem. Pp. 541-577. *In* R. A. Garrott, P. J. White, and F. G. R. Watson, eds. The Ecology of Large Mammals in Central Yellowstone: Sixteen Years of Integrated Field Studies. Elsevier Inc., 600 Technology Square, 5th Floor, Cambridge, MA 02139. Vol. 3, 693 pp.

Hanauska-Brown, L., L. Bradley, J. Gude, N. Lance, K. Laudon, A. Messer, A. Nelson, M. Ross, and J. Steuber. 2012. Montana Gray Wolf Conservation and Management 2011 Annual Report. MFWP, Helena, Montana. 54 pp.

Hansen, A., L. Baril, R. Renkin, T. McvEneaney, and D. W. Smith. 2005. Report to the Yellowstone center for resources. Yellowstone NP, Wyo.

Hebblewhite, M. and D. W. Smith. 2010. Wolf community ecology: Ecosystem effects of recovering wolves in Banff and Yellowstone National Parks. Pp. 69-120. *In* M. Musiani, L. Boitaini, and P. C. Paquet, eds. The World of Wolves: New Perspectives on Ecology, Behavior, and Management. Univ. Calgary Press, Calgary, Alb., Can.

Holt, R. D. and M. Roy. 2007. Predation can increase the prevalence of infectious disease. Amer. Natur. 169: 690-699.

Howard, W. E. 1986. Nature and animal welfare: Both are misunderstood. Exposition Press of Fla., Inc., Pompano Beach.

Howery, L. D. and T. J. DeLiberto. 2004. Indirect effects of carnivores on livestock foraging behavior and production. Sheep and Goat Res. J. 19:53-57.

Husseman, J. 2002. Prey selection patterns of wolves and cougars in east-central Idaho. Thesis. Univ. Idaho, Moscow.

Idaho Department of Fish and Game (IDFG). 2008. Idaho Wolf Population Management Plan 2008-2012. IDFG, Boise, Id. @ http://fishandgame.idaho.gov/public/docs/wolves/plan08.pdf. *Last visited 10/3/2012*.

Idaho Legislative Wolf Oversight Committee. 2002. Idaho Wolf Conservation and Management Plan. ILWOC, as amended by the 56th Id. Legislature, 2nd Regular Session, March. 32 pp.

International Union of Nature and Natural Resources (IUCN). 1994. Manifesto on wolf conservation. International Wolf Mag. Winter Edition. Pp.16-17.

Julien, T. J., S. M. Vantassel, S. R. Groepper, and S. E. Hyngstrom. 2010. Euthanasia methods in field settings for wildlife damage management. Human-Wildlife Interactions 42: 158-164.

Karlsson, J. and O. Johansson. 2010. Predictability of repeated carnivore attacks on livestock favours reactive use of mitigation measures. J. Applied Ecol. 47(1): 166-171.

Keith, L. B. 1983. Population dynamics of wolves. Pp. 66–77. *In* L. N. Carbyn, ed. Wolves in Canada and Alaska: Their Status, Biology, and Management. Can. Wildl. Serv., Rep. Ser. 45.

Kellert, S. R. 1999. The public and the wolf in Minnesota. Rept. to International Wolf Center, Minneapolis, Minn..

Kellert, S. R. and J. K. Berry. 1980. Knowledge, affection and basic attitudes toward animals in American Society. USFWS and U.S. Dept. Commerce, Springfield, VA.

Kluever, B. M., S. W. Breck, L. D. Howery, P. R. Krausman, and D. L. Bergman. 2008. Vigilance in cattle: the influence of predation, social interactions and environmental factors. Range. Ecol. & Manage. 61: 321-328.

Kortello, D., E. Hurd, and L. Murray. 2007. Interactions between cougars (*Puma concolor*) and gray wolves (*Canis lupus*) in Banff National Park, Alberta. Ecoscience 14: 214-222.

Kreeger, T. J. 2003. The internal wolf: Physiology, pathology and pharmacology. Pp. 192- 217. *In* L. D. Mech and L. Boitani, eds. Wolves: Behavior, Ecology, and Conservation. Univ. Chicago Press, Chicago, Ill.

Kunkel, K. E. 1997. Predation by wolves and other large carnivores in northwestern Montana and southeastern British Columbia. Ph. D. Dissertation, Univ. Mont., Missoula.

Kunkel, K. E. and D. H. Pletscher. 1999. Species-specific population dynamics of cervids in a multipredator ecosystem. J. Wildl. Manage. 63: 1082-1093.

Lehmkuhler, J., G. Palmquist, D. Ruid, R. Willging, and A. Wydeven. 2007. Effects of wolves and other predators on farms in Wisconsin: beyond verified losses. Wisc. Dept. Nat. Resources, Madison Pub-ER-658:2007

Linhart, S. B. 1984. Strobe light and siren devices for protecting fenced-pasture and range sheep from coyote predation. Proc. Vertebr. Pest Conf. 11:154-156.

Linnell, J. D. C., M. E. Smith, J. Odden, J. E. Swenson, and P. Kaczensky. 1996. Carnivore and sheep farming in Norway. 4. Strategies for the reduction of carnivore- livestock conflicts: a review. NINA (Norsk Institute for Naturforskning) Oppdragsmelding 443: 1-118.

Linnell, J. D. C., R. Anderson, Z. Andersone, L. Balciauskas, J. C. Blanco, L. Boitani, S. Brainerd, U. Breitenmoser, I. Kojloa, O. Liberg, J. Loe, H. Okarma, H. C. Pedersen, C. Promberger, H. Sand, E. J. Valdmann, and P. Wabakken. 2002. The fear of wolves: a review of wolf attacks on humans. NINA Oppdragsmelding 731:1-65.

Mack, J. A., W. G. Brewster, and S. H. Fritts. 1992. A review of wolf depredation on livestock and implications for the Yellowstone area. Pp. 3-20. *In* J. D. Varley and W G. Brewster, eds. Wolves for Yellowstone? A Report to the United States Congress. Vol. IV Res. & Analysis. NPS, Yellowstone NP, Mammoth Hot Springs, Wyo.

Mackie, R. J., D. F. Pac, K. L. Hamlin, and G. L. Dusek. 1998. Ecology and Management of Mule Deer and White-tailed Deer in Montana. MFWP, Wildlife Division, Helena, Mont. Fed. Aid Proj. W-120-R.

MacNulty, D. R., D. W. Smith, J. A. Vucetich, L. D. Mech, D. R. Stahler, and C. Packer. 2009*a*. Predatory senescence in ageing wolves. Ecol. Letters 12:1347-1356.

MacNulty, D. R. D. W. Smith, L. D. Mech, and L. E. Eberly. 2009*b*. Body size and predatory performance in wolves: is bigger better? J. Animal Ecol. 78: 532-539

Mader, T. R. 2008. Wolves and hunting. Sportsmen's Voice. Summer 2008. Sportsmen for Fish and Wildlife, Ogden, Utah.

Mao, J. S., M. S. Boyce, D. W. Smith, F. J. Singer, D. J. Vales, J. M. Vore, and E. H. Merrill. 2005. Habitat selection by elk before and after wolf reintroduction in Yellowstone National Park. J. Wildl. Manage. 69:1691-1707.

McNay, M. E. 2002. Wolf-human interactions in Alaska and Canada: a review of the case history. Wildl. Soc. Bull. 30:831-843.

McNay, M. E. 2007. A review of evidence and findings related to the death of Kenton Carnegie on November 8, 2005 near Points North, Sask., Can.

Mech, L. D. 1970. The Wolf: the Ecology and Behavior of an Endangered Species. The Natural History Press, Doubleday, New York, NY. 384 pp.

Mech, L. D. 1995. The challenge and opportunity of recovering wolf populations. Conserv. Biol. 9:270-278.

Mech, L. D. 2001. Managing Minnesota's recovered wolves. Wildl. Soc. Bull. 29:70-77.

Mech, L. D. and L. Boitani. 2003. Wolf social ecology. Pp. 1–34. *In* L. D. Mech and L. Boitani, eds. Wolves: Behavior, Ecology and Conservation. Univ. Chicago Press, Chicago, Ill.

Mech, L. D., S. H. Fritts, and M. E. Nelson. 1996. Wolf management in the 21st Century: from public input to sterilization. J. Wildl. Res. 1:195-198.

Mech, L. D., E. K. Harper, T. J. Meier, and W. J. Paul. 2000. Assessing factors that may predispose Minnesota farms to wolf depredations on cattle. Wildl. Soc. Bull. 28:630-635.

Mech, L. D. and M. E. Nelson. 2000. Do wolves affect white-tailed buck harvest in northeastern Minnesota? J. Wildl. Manage. 64(1):129-136.

Mech, L. D, D. W. Smith, K. M. Murphy, and D. R. MacNulty. 2001. Winter severity and wolf predation on a formerly wolf-free elk herd. J. Wildl. Manage. 65:998-1003.

Mladenoff, D. J., T. A. Sickley, R. G. Haight, and A. P. Wydeven. 1995. A regional landscape analysis and prediction of favorable gray wolf habitat in the northern Great Lakes Region. Conserv. Biol. 9:279-294.

Montana Fish, Wildlife and Parks Division (MFWP). 2003. Montana Gray Wolf Conservation and Management Plan, Final Environmental Impact Statement. MFWP, Wildl. Div., Helena, Mont. August. 420 pp.

_____ MFWP. 2004. Montana Statewide Elk Management Plan. MFWP, Wildl. Div., Helena, Mont. 397 pp.

_____ MFWP. 2007. Montana gray wolf conservation and management 2006 annual report. Compilers: Sime, C. A., V. Asher, L. Bradley, K. Laudon, M. Ross, J. Trapp, M. Atkinson, L. Handegard, and J. Steuber. MFWP, Helena, Mont. 96 pp.

_____ MFWP. 2008. Montana gray wolf conservation and management 2007 annual report. Compilers: Sime, C. A., V. Asher, L. Bradley, K. Laudon, M. Ross, J. Trapp, M. Atkinson, and J. Steuber. MFWP, Helena, Mont. 137 pp.

_____ MFWP. 2009. Montana gray wolf conservation and management 2008 annual report. Compilers: Sime, C. A., V. Asher, L. Bradley, K. Laudon, N. Lance, and M. Ross, and J. Steuber. MFWP, Helena, Mont. 154 pp.

_____ MFWP. 2010. Montana gray wolf conservation and management 2009 annual report. Compilers: Sime, C. A., V. Asher, L. Bradley, K. Laudon, N. Lance, and M. Ross, and J. Steuber. MFWP, Helena, Mont. 173 pp.

_____ MFWP. 2011*a*. Hunting season/Quota change supporting information: Gray wolves. MFWP, Helena, Mont., Wildl. Staff. 4/28/11. 18 pp. @ http://fwp.mt.gov/fwpDoc.html?id=54225. *Last visited 10/3/2012*.

_____ MFWP. 2011*b*. Montana gray wolf conservation and management 2010 annual report. Compilers: Sime, C. A., V. Asher, L. Bradley, N. Lance, K. Laudon, M. Ross, A. Nelson, and J. Steuber. MFWP, Helena, Mont. 168 pp.

_____MFWP. 2012. Wolves and people: Wolves and wolf parasites. MFWP. Website @ http://fwp.mt.gov/fishAndWildlife/management/wolf/safety.html. *Last visited 10/3/2012.*

Montana Livestock Loss Board (MLLB). 2012. Livestock Loss Board: Livestock Loss Statistics. MLLB, Helena, Mont. Website @ http://liv.mt.gov/llb/default.mcpx. *Last visited 10/5//2012.*

Montana Natural Heritage Program (MNHP). 2012. Species of Concern. MNHP. Website @ http://mtnhp.org/. *Last visited 10/3/2012.*

MSNBC. 2012. Fatal wolf attack unnerves Alaska village. MSNBC, Anchorage, Alaska. March 17. Website @ http://www.msnbc.msn.com/id/35913715/ns/us_news-life/. *Last visited 10/2/2012.*

Murphy, K. M. 1998. The ecology of the cougar (*Puma concolor*) in the northern Yellowstone ecosystem: interactions with prey, bears, and humans. PhD Dissertation, Univ. Idaho, Moscow.

Musiani, M., C. Mamo, L. Boitani, C. Callaghan, C. Cormack Gates, L. Mattei, E. Visalberghi, S. Breck, and G. Volpi. 2003. Wolf depredation trends and the use of fladry barriers to protect livestock in western North America. Conserv. Biol. 17: 1538-1547.

Nass, R. D., and J. Theade. 1988. Electric fences for reducing sheep losses top predators. J. Range Manage. 412: 251-252.

Naughton-Treves, L., R. A Grossberg, and A. Treves. 2003. Paying for tolerance: rural citizens' attitudes toward wolf depredation and compensation. Cons. Biol. 17: 1500-1511.

Naughton, L., A. Treves, R. Grossberg, and D. Wilcove. 2005. Public opinion survey: wolf management in Wisconsin. Univ. Wisc., Madison. Website @ http://www.geography.wisc.edu/livingwithwolves/public_reports.htm. *Last visited 10/3/2012.*

Nielson, L. 1988. Definitions, considerations, and guidelines for translocation of wild animals. Pp. 12-49. *In* Translocation of Wild Animals. L. Nielson and R. D. Brown, eds. Wisc. Humane Soc., Inc., Madison and Caesar Kleberg Wildl. Res. Inst., Kingsville, Tex. 333 pp.

Oakleaf, J. K. 2002. Wolf-cattle interactions and habitat selection by recolonizing wolves in the northwestern United States. M.S. Thesis, Univ. Idaho, Moscow. 67pp.

Oakleaf, J. K., C. Mack, and D. L. Murray. 2003. Effects of wolves on livestock calf survival and movements in central Idaho. J. Wildl. Manage. 67: 299-306.

Oakleaf, J. K., D. L. Murray, J. R. Oakleaf, E. E. Bangs, C. M. Mack, D. W. Smith, J. A. Fontaine, M. D. Jimenez, T. J. Meier, and C. C. Niemeyer. 2006. Habitat selection by recolonizing wolves in the Northern Rocky Mountains of the United States. J. Wildl. Manage. 70: 554-565.

Olson, J. F., and R. Tischaefer. 2004. Cable restraints in Wisconsin: A guide to responsible use. Wisc. Dept. Nat. Resources, Madison and Wisc. Trappers Assoc., Inc., Oregon, Wisc. Publ. # PUB-WM-443 2004. 22pp.

Packard, J. M. 2003. Wolf behavior: reproductive, social, and intelligent. Pp. 35-65. *In* L. D. Mech and L. Boitani, eds. Wolves: Behavior, Ecology, and Conservation. Univ. Chicago Press, Chicago, Ill.

Packer, C., R. Holt, P. J. Hudson, K. D. Lafferty, and A. P. Dobson. 2003. Keeping the herds healthy and alert: implications of predator control for infectious disease. Ecol. Letters 6:9, 797–802.

Paul, W. and P. Gipson. 1994. Wolves. Pp. C123-C129. *In* S. E. Hygnstrom, R. Timm and G. E. Larson, eds. Prevention and Control of Wildlife Damage. Univ. Nebr. Coop. Ext. Serv., Univ. Nebr., Lincoln.

Pearson, A. M. 1972. Population characteristics of the northern interior grizzly in the Yukon Territory, Canada. International Conf. Bear Res. and Manage. 2:32-35.

Peek, J. M., D. E. Brown, S. R. Kellert, L. D. Mech, J. H. Shaw, and V. Van Ballenberghe. 1991. Restoration of wolves in North America. The Wildl. Soc., Techn. Adv. Comm. on Wolf Reintroduction (*ad hoc*), Bethesda, Md. Techn. Review 91-1.

Pemberton, M. 2007. Yukon River on high alert for rabid wolves. Anchorage Daily News, November 5, 2007.

Peterson, R.O., J.D. Woolington, and T.N. Bailey. 1984. Wolves of the Kenai Peninsula, Alaska. Wildl. Monogr. 88:1-52.

Phillips, R. L., and K. S. Gruver. 1996. Selectivity and effectiveness of the Paw-I-Trip pan tension device on 3 types of traps. Wildl. Soc. Bull. 24:119-122.

Pletscher, D. H., R. R. Ream, R. Demarchi, W. G. Brewster, and E. E. Bangs. 1991. Managing wolf and ungulate populations in an international ecosystem. Trans. N. Amer. Wildl. & Nat. Resources Conf. 56: 539-549.

Potvin, M. J., T. D. Drummer, J. A. Vucetich, D. E. Beyer, R. O. Peterson, and J. H. Hammill. 2005. Monitoring and habitat analysis for wolves in Upper Michigan. J. Wildl. Manage. 69: 1660-1669.

Pynn, L. 2007. Kayaker fights off hungry wolf on North Coast. CanWest News Service, August 1, 2007.

Ripple, W. J. and P. L. Beschta. 2004. Wolves, elk, willows and trophic cascade in the upper Gallatin Range of southwestern Montana, USA. Forest Ecology and Management 200: 161-181.

Ripple W. J. and R. L. Beschta. 2006. Linking wolves to willows via risk sensitive foraging by ungulates in the northern Yellowstone ecosystem. Forest Ecology and Management 230: 96-106.

Ripple, W. J., E. J. Larsen, R. A. Renkin, and D. W. Smith. 2001. Trophic cascades among wolves, elk and aspen on Yellowstone National Park's northern range. Biology Conservation 102: 227-234.

Robbins, J. 2007. Is the West losing its wild? Conde' Nast Traveler. December 2007: 107-120.

Ruth, T. K. 2004. Ghost of the Rockies: the Yellowstone cougar project. Yellowstone Science 12: 13-24.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2011. The North American Breeding Bird Survey, Results and Analysis 1966 - 2010. USGS, Patuxent Wildl. Res. Cen., Laurel, Md. Ver. 12.07.2011.

Schanning, K., M. Demashke, L. Kret, B. Sanford, and J. Vazques. 2003. State of the wolf project: Wisconsin wolf survey 2003. Northland College, Sigurd Olson Environ. Inst., Ashland, Wisc. Unpubl. Rept. 15 pp.

Schmidt, R.H. 1989. Animal welfare and wildlife management. Trans. N. Amer. Wildl. and Nat. Resour. Conf. 54:468-475.

Schmitz O. J, A. P. Beckerman, and K. M. O'Brien. 1997. Behaviorally mediated trophic cascades: effects of predation risk on food web interactions. Ecol. 78:1388–1399.

Schueler, D.G. 1993. Contract Killers. Sierra 78(6):70-76.

Schultz, R. N., K. W. Jonas, L. H. Skuldt, and A. P. Wydeven. 2005. Experimental use of dog-training shock collars to deter depredation by gray wolves. Wildl. Soc. Bull. 33: 142-148.

Servheen, C., J. S. Waller, and P. Sandstrom. 2003. Identification and management of linkage zones for wildlife between large blocks of public land in the northern Rocky Mountains. USFWS, Missoula, Mont.

Shelton, M. 2004. Predation and livestock production – perspective and overview. Sheep and Goat Res. J. 19:2-5.

Shivik, J. A. 2004. Nonlethal alternatives for predation management. Sheep and Goat Res. J. 19:64-71.

Shivik, J. A., and D. J. Martin. 2001. Aversive and disruptive stimulus applications for managing predation. Proc. Wildl. Damage Manage. Conf. 9:111-119.

Shivik, J. A., A. Treves, and P. Callahan. 2003. Nonlethal techniques for managing predation: primary and secondary repellents. Cons. Biol. 17: 1531-1538.

Sikes, D. S. 1994. Influence of ungulate carcasses on coleopteran communities in Yellowstone National Park. Thesis. Montana State University, Bozeman, USA.

Slate, D. A., R. Owens, G. Connelly, and G. Simmons. 1992. Decision making for wildlife damage management. Trans. N.A. Wildl. and Nat. Res. Conf. 57:51-62.

Smith, R. H., D. J. Neff, and N. G. Woolsey. 1986. Pronghorn response to coyote control - A benefit:cost analysis. Wildl. Soc. Bull. 14:226-231.

Smith, D.W., R.O. Peterson, and D. Houston. 2003. Yellowstone after wolves. BioScience 53: 330-340.

Smith, D. W., T. D. Drummer, K. M. Murphy, D. S. Guernsey, and S. B. Evans. 2004. Winter prey selection and estimation of wolf kill rates in Yellowstone National Park, 1995-2000. J. Wildl. Manage. 68:153-166.

Smith, D. W., D. R. Stahler, D. S. Guernsey, M. Metz, A. Nelson, E. Albers, and R. McIntyre. 2007. Yellowstone wolf project: annual report, 2006. YCR-NR-2007-01, U.S. Dept. Interior, NPS, 82 Yellowstone Center for Resources, Yellowstone NP, Wyo.

Smith, T. 2012. Sheriff:Dog was poisoned. Idaho Mtn. Express. September 26, 2012. @ http://www.mtexpress.com/index2.php?ID=2005144058. *Last visited 10/3/2012.*

Stahl, G. 2004. Dogs believed to be poisoned. Idaho Mtn. Express July 28, 2004. @ http://mtexpress.com/2004/04-07-28/04-07-28poison.htm. *Last visited 10/3/2012.*

Texas Department of Agriculture. 2009. Preventing pesticide misuse in controlling animal pests. TDA, Austin, TX. Website @ http://www.texasagriculture.gov/Portals/0/Publications/PEST/pes_misuse.pdf. *Last visited 10/3/2012.*

Till, J. A. 1992. Behavioral effects of removal of coyote pups from dens. Proc. Vertebr. Pest Conf. 15: 396-399.

Till, J. A. and F. F. Knowlton. 1983. Efficacy of denning in alleviating coyote depredations upon domestic sheep. J. Wildl. Manage. 47: 1018-1025.

Trees A. J., H. C. Davison, E. A. Innes, M. Wastling. 1999. Towards evaluating the economic impact of bovine neosporosis. Int. J. Parasitol. 29:1195-200.

Treves, A., R. R. Jurewicz, L. Naughton-Treves, R. A. Rose, R. C. Willging, and A. P. Wydeven. 2002. Wolf depredation on domestic animals in Wisconsin, 1976-2000. Wildl. Soc. Bull. 30:231-241.

Treves, A., and L. Naughton-Treves. 2005. Evaluating lethal control in the management of human-wildlife conflict. Pp. 86-106. *In* People and Wildlife: Conflict or Coexistence. R. Woodroffe, S. Thirgood, A. Rabinowitz, eds. Univ. Cambridge Press, United Kingdom.

Turkowski, F. J., A. R. Armistead, and S. B. Linhart. 1984. Selectivity and effectiveness of pan tension devices for coyote foothold traps. J. Wildl. Manage. 48:700-708.

United Kingdom Department of Environment, Food, and Rural Affairs. 2012. Campaign for accidental and illegal poisoning. DEFRA- Wildlife Incident Investigation Scheme. @ http://www.caip-uk.info/default.aspx. *Last accessed 10/02/2012*.

U.S. Department of Agriculture (USDA). 1997. Animal Damage Control Program Final Environmental Impact Statement. (*Revision*) USDA-APHIS-WS, Operational Support Staff, 6505 Belcrest Rd., Room 820 Federal Bldg., Hyattsville, MD 20782. 314 pp. + App.

U.S. Fish and Wildlife Service (USFWS). 1980. Northern Rocky Mountain wolf recovery plan. U.S. Fish and Wildlife Service, Denver, Colorado, USA.

_____ USFWS. 1987. Northern Rocky Mountain wolf recovery plan. U.S. Fish and Wildlife Service. Region 6, Denver, Colorado, USA.

_____ USFWS. 1993. Grizzly bear recovery plan. USFWS, Missoula, Montana, USA.

_____ USFWS. 1994. The reintroduction of gray wolves to Yellowstone National Park and central Idaho: Final environmental impact statement. U.S. Fish and Wildlife Service, Denver, Colorado, USA.

_____ USFWS. 1996. Bitterroot Ecosystem recovery plan chapter – supplement to the grizzly bear recovery plan. USFWS, Missoula, Mont.

_____ USFWS. 2003. Endangered and threatened wildlife and plants; final rule to reclassify and remove the gray wolf from the list of endangered and threatened wildlife in portions of the conterminous United States; establishment of two special regulations for threatened gray wolves; final and proposed rules. Federal Register 68: 15803-15875.

_____ USFWS. 2006. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. U.S. Dept. Interior, USFWS and U.S. Dept. Commerce, Econ. & Stats. Admin., Census Bureau. Report FHW/06-NAT. 164 pp.

_____ USFWS. 2007. Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area. Interagency Conservation Strategy Team: USFWS, USFS, BLM, NPS, USGS, IDFG, MFWP, and WGFD. USFWS, Region 6, Denver, CO. 86pp.

_____ USFWS. 2008. Finding of No Significant Impact and Final Environmental Assessment for Revision of Special Regulation for the Reintroduction of Gray Wolves into the Central Idaho and Yellowstone Areas. USFWS, Mtn. Prairie Region, Denver, Colo. 86 pp.

_____ USFWS. 2009*a*. Biological Opinion on the Effects of the Statewide Montana Wildlife Services' Wildlife Damage Program on Canada Lynx. USFWS, Mont. Field Office, Helena. 38 pp.

_____ USFWS. 2009*b*. Wyoming gray wolf recovery status report for the week of May 11-15, 2009. USFWS, Wash., D.C. Website @ http://www.fws.gov/mountain-prairie/species/mammals/wolf/wyoming Status09/ 05152009.html.

_____ USFWS. 2012*a*. Endangered species program. USFWS Website @ http://www.fws.gov/endangered/. *Last visited 10/3/2012.*

_____ USFWS. 2012*b*. Gray wolves in the northern Rocky Mountains: News, information and recovery reports. USFWS with coop. agencies on reports: BN, CSKT, IDFG, MFWP, NPS, Nez Perce Tribe, Ore. Dept. Fish & Wildl., Utah Dept. Nat. Resour., Wash. Dept. Fish & Wildl., WS, and Wind River Tribes. Annual Reports for 1999 to 2011. Updated Sept. 11. Website @ http://www.fws.gov/mountain-prairie/species/mammals/wolf/. *Last visited 10/3/2012.*

_____ USFWS. 2012*c*. Biological Opinion on the Effects of the Statewide Montana Wildlife Services' Wildlife Damage Program on Grizzly Bears. USFWS, Mont. Field Office, Helena. June 8. 39 pp.

U.S. Forest Service (USFS). 2006. Forest Service Manual. USFS, Wash., D.C. Website @ http://www.fs.fed.us/im/directives/.

VonHoldt, B. M., D. R. Stahler, D. W. Smith, D. A. Earl, J. P. Pollinger, R. K. Wayne. 2008. The genealogy and genetic viability of reintroduced Yellowstone grey wolves. Molecular Ecology 17: 252-274.

VonHoldt, B. M., D. R. Stahler, E. E. Bangs, D. W. Smith, M. D. Jimenez, C. M. Mack, C. C. Niemeyer, J. P. Pollinger, and R. K. Wayne. 2010. A novel assessment of population structure and gene flow in grey wolf populations of the Northern Rocky Mountains of the United States. Molecular Ecology 19: 4412-4427.

Wade, D. A., and J. E. Bowns. 1982. Procedures for evaluating predation on livestock and wildlife. Texas Agricultural Extension Service, Texas A & M University, College Station, USA.

Wildlife Services (WS). 1997*a*. Predator damage management in eastern Montana. Environmental Assessment, Finding of No Significant Impact, and Record of Decision. 9/11/1997. USDA-APHIS-WS, PO Box 1938, Billings, MT. 119 pp.

_____ WS. 1997. Predator damage management in western Montana. Environmental Assessment, Finding of No Significant Impact, and Record of Decision. 5/19/1997. USDA-APHIS-WS, PO Box 1938, Billings, MT. 120 pp.

_____ WS. 2005. Predator damage management in Colorado. Environmental Assessment, Finding of No Significant Impact, and Record of Decision. 12/16/05. USDA-APHIS-WS, 12345 West Alameda Pkwy., Suite 210, Lakewood, CO 80228. 246 pp.

_____ WS. 2010. Idaho Wildlife Services wolf activity report fiscal year 2009. United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Boise, ID.

Wildlife Society, The. 1992. Conservation policies of the Wildlife Society: A stand on issues important to wildlife conservation. Wildl. Soc., Bethesda, Md. 24pp.

Wildlife Society, The. 2010. TWS position statement on wildlife damage management. Wildl. Soc., Bethesda, MD 2pp.

Wilmers, C. C., D. R. Stahler, R. L. Crabtree, D. W. Smith, and W. M Getz. 2003. Resource dispersion and consumer dominance: Scavenging at wolf- and hunter-killed carcasses in Greater Yellowstone. Ecol. Letter 6: 996-1003.

Wisconsin Department of Natural Resources. 1999. Wisconsin Wolf Management Plan. WDNR, P.O. Box 7921, Madison, Wisc. 53707. PUBL-ER-099 99. 74 pp.

Wydeven, A. P., and J. E. Weidenhoeft. 2007. Gray wolf population 2006-2007. Wisc. Dept. Nat. Resour., Bureau of Endangered Resources, Madison, Wisc.

Wydeven, A. P., J. E. Wiedenhoeft, R. P. Thiel, R. N. Schultz, And S. R. Boles. 2007. Progress Report of Wolf Population Monitoring in Wisconsin for the Period October 2006 - March 2007. Wisc. Dept. Nat. Resour., Bureau of Endangered Resources, Madison, Wisc

Wyoming Game and Fish Commission. 2011. Wyoming Gray Wolf Management Plan. Wyo. Game & Fish Commission, 5400 Bishop Blvd. Cheyenne, Wyo. 82006

Appendix A: DEPREDATION INVESTIGATION FORM

DEPREDATION INVESTIGATION FORM

U.S. DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WILDLIFE SERVICES

WILDLIFE SERVICES DEPREDATION INVESTIGATION REPORT

		REPORT NUMBER
		DATE COMPLAINT RECEIVED
SPECIES	NAME OF INVESTIGATOR(S)	DATE INVESTIGATED
NAME AND ADDRESS OF LIVESTOCK OWNER/LEASEE		TELEPHONE NUMBER
		COUNTY

LAND OWNERSHIP ☐ STATE ☐ BLM ☐ TRIBAL ☐ PRIVATE ☐ FS ☐ OTHER (Specify)	TYPE OF LIVESTOCK/PROPERTY ☐ HORSE ☐ BEES ☐ SHEEP ☐ CATTLE ☐ OTHER (Specify)

LOSSES AND/OR PROPERTY DAMAGE (See criteria on reverse side of form)

No. Confirmed	No. Probable	No. Possible/Unknown	No. Other (Specify)

SITE DESCRIPTION/PHYSICAL EVIDENCE PRESENT (i.e., tracks, scat, hair, blood, signs of struggle, scrapes, etc.)

CARCASSES/PROPERTY DAMAGE CHARACTERISTICS (i.e., puncture marks, feeding patterns, measurements between canines, signs of hemorrhage, etc.)	ESTIMATED TIME SINCE PREDATION/DAMAGE OCCURRED (Days/hours)

ACTIONS TAKEN	DATE STARTED	DATE ENDED

NAME OF WS INVESTIGATOR	SIGNATURE	DATE
NAME OF DISTRICT SUPERVISOR	SIGNATURE	DATE
NAME OF STATE REPRESENTATIVE	SIGNATURE	DATE

DISPOSITION OF CARCASS/PARTS

WS FORM 200 (OCT 99) COPY DISTRIBUTION: WHITE - State Office YELLOW - District Supervisor PINK- State GOLDENROD- Investigator

CRITERIA FOR CLASSIFICATION OF REPORTED DEPREDATION INCIDENTS

Reported wolf, bear, or lion depredation incidents should be classified as either **confirmed, probable, possible/unknown**, or **other**, based on the following criteria. *For MIS reporting purposes, "reported" damage may often include incidents described as* ***probable, possible/unknown,***

CONFIRMED – Depredation is **confirmed** in those cases where there is reasonable physical evidence that an animal was actually attacked or killed by a predator. The primary confirmation factor would ordinarily be the presence of bite marks and associated subcutaneous hemorrhaging and tissue damage, indicating that the attack occurred while the victim was alive, as opposed to simply feeding on an already dead animal. Spacing between canine tooth punctures, feeding pattern on the carcass, fresh tracks, scat, hairs rubbed off on fences or brush, or eye witness accounts of the attack may help identify the specific species or individual responsible for the depredation. Predation might also be confirmed in the absence of bite marks and associated hemorrhaging (*i.e.,* if much of the carcass has already been consumed by the predator or scavengers) **if** there is other physical evidence to confirm predation on the live animal. This might include blood spilled or sprayed at a nearby attack site or other evidence of an attack or struggle. There may also be nearby remains of other victims for which there is still sufficient evidence to confirm predation, allowing reasonable inference of confirmed predation on the animal that has been largely consumed.

PROBABLE – Having some evidence to suggest possible predation, but lacking sufficient evidence to clearly confirm predation by a particular species, a kill may be classified as **probable** depending on a number of other factors such as: (1) Has there been any recently confirmed predation by the suspected depredating species in the same or nearby area? (2) How recently had the livestock owner or his employees observed the livestock? (3) Is there evidence (telemetry monitoring data, sightings, howling, fresh tracks, etc.) to suggest that the suspected depredating species may have been in the area when the depredation occurred? All of these factors, and possibly others, should be considered in the investigator's best professional judgment.

POSSIBLE/UNKNOWN – Lacking sufficient evidence to classify an incident as either confirmed or probable predation, the **possible/unknown** classification is appropriate if it is unclear what the cause of death may have been. The investigator may or may not have much of a carcass remaining for inspection, or the carcass may have deteriorated so as to be of no use. The investigator would want to consider if the area has been frequented by a predator, or if the habitat is one which the predator is likely to use. Possible predation may include cases where counts show that abnormal numbers of livestock are missing or have disappeared above and beyond past experience, and where other known cases of predation have occurred previously in the area.

OTHER – Cause of livestock deaths should be classified as **other** when it is discovered that the cause of death was not likely caused by the animal originally reported to Wildlife Services during a request for assistance. Examples of **other** may include cases where the cause of death is confirmed or is likely due to predation by some other animal or cause determined at the time of the investigation such as red fox instead of coyote or other causes such as, bloat, poisonous plants, stillborn, disease, lightning strike, vehicle collision, etc. If the specific other cause of death can be determined, it should be written in the space provided for Other.

WS FORM 200 (Reverse)